# Mining

AMC

CONGRESS JOURNAL

# For top belt-conveyor efficiency, top mining men rely on LINK-BELT

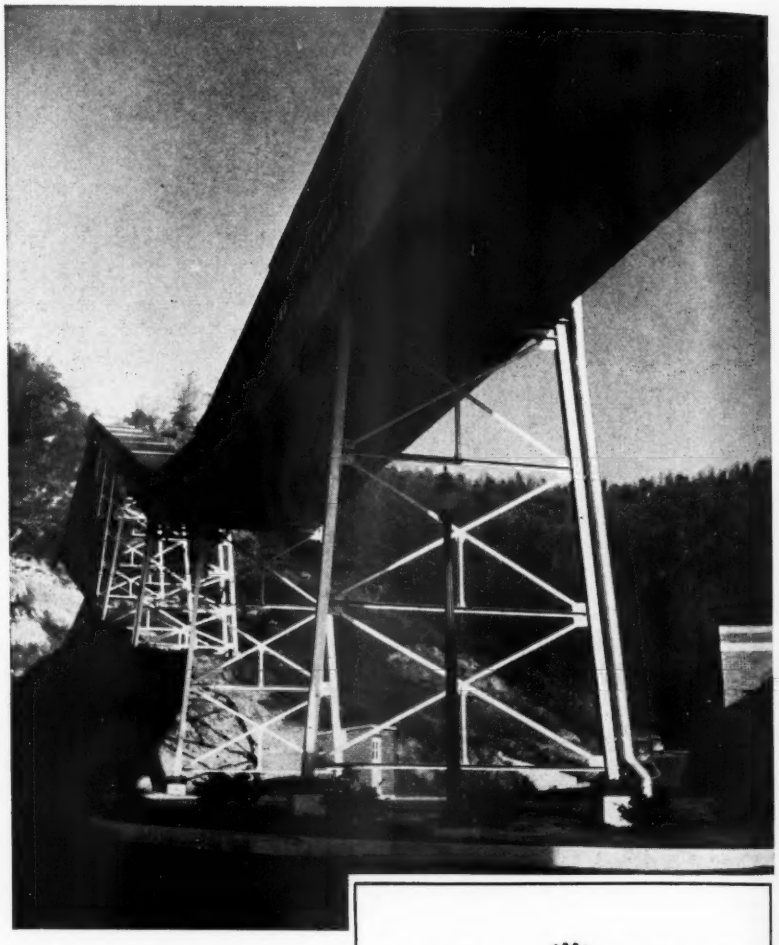
## LINK-BELT engineering experience plus quality components combine to cut handling costs

Yes, in mines everywhere, Link-Belt is first choice in belt conveyors. Whether your job is large or small, Link-Belt can apply unequalled engineering experience to meet the conditions of your particular system.

Link-Belt builds a complete line of quality components. Our conveyor engineers can choose from all types and sizes of idlers, trippers and terminal machinery to match your exact requirements.

Link-Belt can also supply all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers. And Link-Belt will build your supporting structures and enclosures . . . install the job completely if desired.

Link-Belt will gladly work with your engineers or consultants. Get in touch with your nearest Link-Belt office.



Over a street and up a mountain an enclosed Link-Belt 30 in. belt conveyor carries mine rock and washer refuse from Link-Belt-equipped coal preparation plant.

**LINK-BELT COMPANY:** Chicago 9, Philadelphia 40, Pittsburgh 13, Wilkes-Barre, Huntington 9, W. Va., Louisville 2, Denver 2, Kansas City 8, Mo., Cleveland 15, Indianapolis 6, Detroit 4, Birmingham 3, St. Louis 1, Salt Lake City 1, Seattle 4, Toronto 8, Springs, (South Africa), Sydney (Australia).

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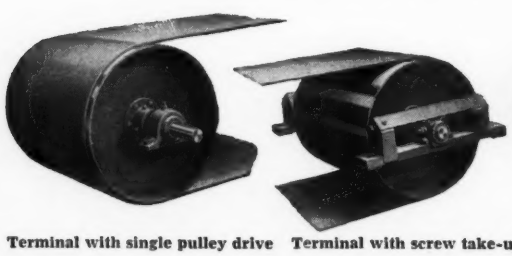
**LINK-BELT**

**BELT CONVEYOR EQUIPMENT**

## LINK-BELT Pre-Selected Terminals—the right equipment for every requirement



Terminal with single pulley drive



Terminal with screw take-up

Terminal with snubbed pulley drive

Terminal with counterweighted take-up

# Whaley "Automat" Now Available with Crawler Mounting for Off Track Loading

## Shovel Action Loader Now Built Either Track Mounted or Crawler Mounted

THE CRAWLER MOUNTED Whaley "Automat" is shown here in operation under the strenuous loading conditions of iron ore. Note the clean floor left by the machine.

The shovel action Whaley "Automat" loading machine is now available for off track loading as well as track loading.

Myers-Whaley Co., Knoxville, Tenn., builders of the first successful underground loading machine, are now building the Whaley "Automat" on crawler mount for operation in mines where off track loading is most desirable.

The Whaley "Automat" Crawler Unit is a completely independent structure upon which the "Automat" loading machine is mounted. The loading machine above the crawler mounting is the same Whaley "Automat," either the No. 3 or the No. 3-LS, as the track mounted machine, but omitting the axles and track wheels, and with the main frame of the loading machine set down on and supported by the crawler frame.

All the advantages of the track machine are obtained in the crawler mounted "Automat," plus a very simple and efficient crawler mechanism.

The Crawler Mounted "Automat" has all the exclusive advantages of the track machine. 1—The exclusive, natural, automatic shovel action. 2—Safe loading with no sudden side kicking of rear conveyor. 3—The parallel lift rear conveyor which takes full advantage of limited head room. 4—A rated 7 ton per minute loading capacity with only one motor and it only 25 HP.

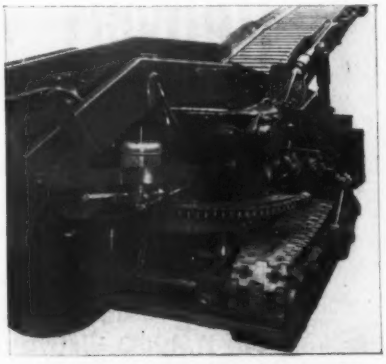
Basic mechanical features include: Two speed tramming. Power driven spooling reel for the trailing cable, and automatic lubrication.

The hydraulic control system for the crawler unit is separate from the main hydraulic system of the loading machine. Three additional valves in one bank are used for the crawler control.

An important advantage of the Whaley "Automat" on Crawler Mounting is that the use of the steering is greatly reduced as the machine will carry up a width of 16 to 18 feet from just one setting of the crawlers. This means that the machine is easy on the bottom.

The loading capacity of the Crawler Mounted "Automat" is 280 cu. ft. per minute. It averages 120 cu. ft. per minute.

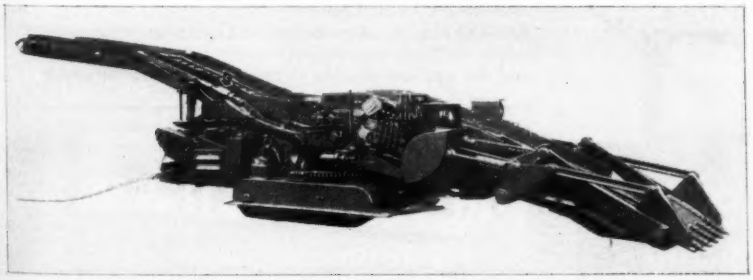
Complete information on the Whaley "Automat," track mounted and crawler mounted, coal and rock



CLOSE UP is shown here of the crawler mount with guards removed on left side.

loaders may be obtained by writing Myers-Whaley Company.

Folder No. 472 gives details and specifications on the Whaley "Automat" track mounted loaders. Folder No. 2015 gives the details and specifications on the Whaley "Automat" crawler mounted loaders.



HERE IS THE CRAWLER MOUNTED Whaley "Automat" in normal loading position. Note the adequate protection guards over crawlers. This is a right hand controlled machine. Left or right controls are optional, either on the Jib or Main Frame.

**MYERS-WHALEY**
**KNOXVILLE, TENN.**

# For the War Against Wear in the Fight for Economy

# AMSCO

## Manganese and Hardfacing Rods

**AMSCOATING**
*THE RIGHT WAY TO SAY HARDFACING*

**Immediate Delivery**

Impact and abrasion are always at work but their effects can be postponed through the use of AMSCO Welding Products. Reclamation and rebuilding of worn or damaged equipment parts by Amscoating means dollar-saving, long-lasting protection. The AMSCO Hardfacing System successfully fights wear caused by impact, abrasion, heat or corrosion. It assures longer equipment life and fewer repairs.

**AMSCO AW-79** will meet every requirement for better control of wear where abrasion and impact are important factors—plus all the advantages of automatic welding. Especially suitable for rebuilding and hardfacing tractor rollers, steel wheels, sheeting rolls, dredge pins as well as dozens of other applications. ½" and 1/16" in 22½" ID., 100 lb. coils.

**AMSCO No. 459** for severe abrasion, mild impact. Has excellent abrasion resistance. All diameters, bare and coated.

**AMSCO No. 217** for abrasive service up to 1100° F. The deposit retains hardness at high temperatures. All diameters, bare and coated.

**AMSCO No. 6** for combination of corrosion or abrasion, or for 1000° service and above. Used as facings for tool and die applications. No. 1 has greater abrasion resist-

***For prompt delivery of these welding products, contact your AMSCO distributor.***

This Weld Chart can save you money. Listing over 50 common hardfacing applications, it recommends the right AMSCO rod to use and the preferred method of application. Write for this free weld chart guide today.

AMERICAN
**Brake Shoe**
COMPANY

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis.

# WELDING PRODUCTS

## Manganese Steel Bars and Shapes

## CONTROLS IMPACT and ABRASION

Through many years' experience in the production and application of manganese steel—"the toughest steel known"—AMSCO has developed welding products designed solely to conserve and protect parts exposed to impact and wear. American Brake Shoe Company's scientists and engineers are working continuously to build better defenses against wear in machines and equipment.

AMSCO Welding Rods are known for their excellent service in many applications—from rock crushers to materials handling pumps . . . in forging, rolling, stamping, and cutting . . . for gears, sprocket wheels and clutch cams . . . in grinding, mixing, and chipping operations . . . Whatever your problem of wear, there's a "proved-in-service" AMSCO Hardfacing Product that can solve it.

ance; No. 6 is the tougher, and can be machined. All diameters, bare and coated.

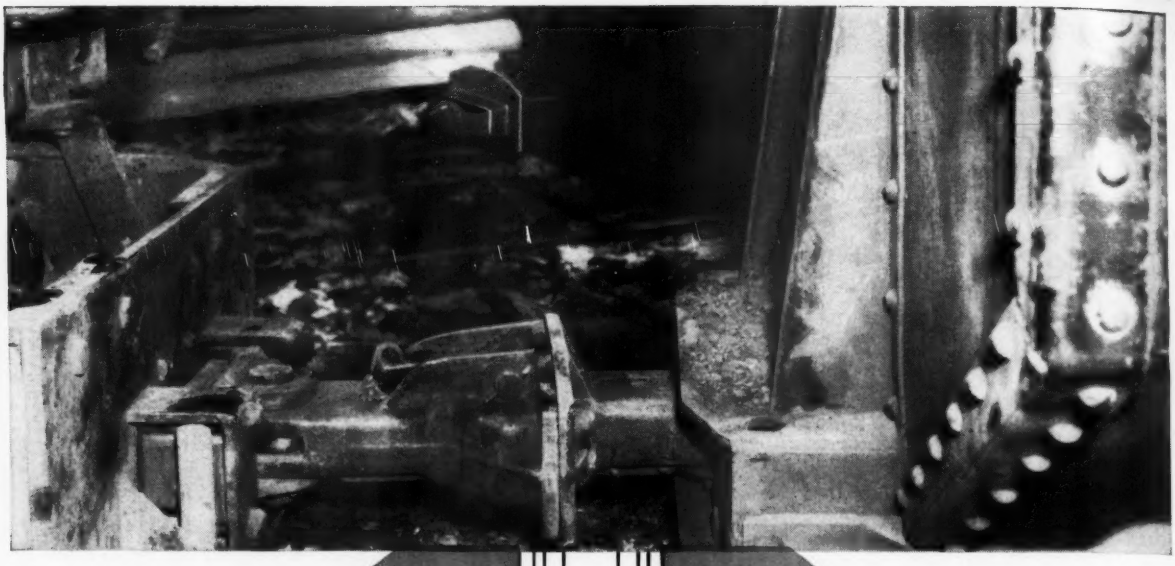
- **AMSCO No. 1** for combination of corrosion or abrasion, or for 1000° service and above. Used as facings for tool and die applications. No. 1 has greater abrasion resistance; No. 6 is the tougher, and can be machined. All diameters, bare and coated.
- **AMSCO FARMFACE** or **AMSCO CHROMEFACE** for industrial and farm use. Deposit has excellent resistance to low stress sliding abrasion. All diameters, bare and coated.
- **AMSCO AIR-HARDENING** for abrasion and severe impact. Deposit can be forged to a sharp edge without losing hardness. All diameters, bare and coated.
- **AMSCO HF-40** for severe abrasion and moderate impact. Deposits of HF-40 are hard and abrasion resistant. All diameters, coated only.
- **AMSCO HF-60** for moderate impact and severe abrasion. This rod is particularly suitable for application in both flat and vertical positions. All diameters, coated only.
- **AMSCO CO-MANG** for build-up on manganese steel castings exposed to severe impact. Deposit has excellent impact resistance. All diameters, coated only.
- **AMSCO TOOLFACE** for metal to metal wear up to 1000° F. Toolface deposits have excellent abrasion resistance. All diameters, bare and coated.
- **AMSCO DIEWELD** for tools and dies. Deposit may be softened for machining and rehardened. Retains a keen cutting edge.
- **AMSCO V-MANG** for build-up on manganese castings exposed to impact.
- **TUNGSTEN CARBIDE.**

A complete line of manganese steel dipper tooth repointer bars and other shapes are available.

## AMERICAN MANGANESE STEEL DIVISION

422 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.



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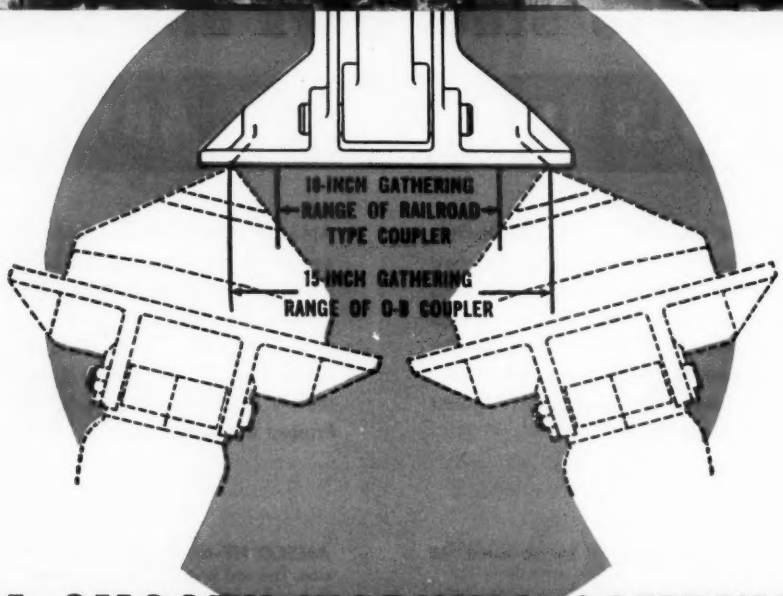


# IT'S A SMOOTH-WORKING COMBINATION

## when these couplers put their heads together

Acting without the guiding hands of a trip-rider or motorman, O-B Mine Car Couplers put their heads together automatically. In so doing, they speed the gathering and coupling operations in a busy haulage system, and help to get more loaded cars to the dump each shift. Even on short-radius curves, dips, or knuckles, the wide gathering range over which these O-B couplers operate makes sure that one head will guide the other as they join, and that each will make a secure connection with the other.

"Joining securely on impact" is the best description of what happens when O-B couplers put their heads together. It is also one of the best features you could want for your haulage system. When it's time to replace present couplers or replace your cars, call in an O-B representative. You will be pleased with the coupler suggestions he can make when you put your heads together!

Ohio Brass

MANSFIELD OHIO, U.S.A.

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*Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress*

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ABC
*Member Audit Bureau of Circulation.*

# only Allis-Chalmers can offer you

# 1000 Hour

## for truck wheels, idlers, support rollers

**FULL PROTECTION — only One Greasing Every 1000 Hours — with Allis-Chalmers *Exclusive* Positive Seal, Roller Bearing Design!**

Think of it! You can operate for 6 months on a 40-hour-week basis with just one lubrication of 14 to 20 of the most-abused, hardest-to-service points on a tractor. It's possible through an exclusive combination of glass-smooth Positive Seals and anti-friction bearings that help you do more work at lower cost even under toughest conditions! And it's another ahead-of-the-field design feature found only in the four new Allis-Chalmers tractors.

### *These Big Benefits Mean DOLLARS to you!*

DAILY GREASING PERIODS ELIMINATED. You save at least 30 minutes every day . . . gain about one full month's production every year.

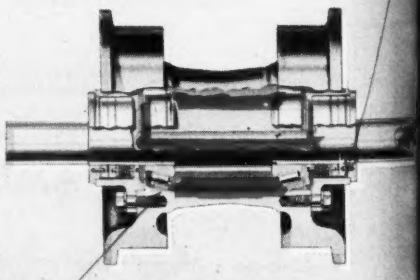
FULL PROTECTION ASSURED. Positive Seals keep grease in . . . dirt and moisture out. 1000-Hour Lubrication gives you protection unchallenged in the tractor field.

SAVES ON GREASE. Truck wheels, idlers and support rollers are grease-filled at the factory . . . need new grease only once every 1000 hours!

EASY TO SERVICE. No more cleaning of dirt, muck and grime from fittings every day. Operator can choose time and place to regrease when conditions are favorable.

### Here's the secret:

**Positive Seals** each have two spring-loaded steel rings — one stationary, the other turning with the wheel. Ground smooth as glass, they seal the grease in . . . keep dirt, grit, dust, mud and water *out*.

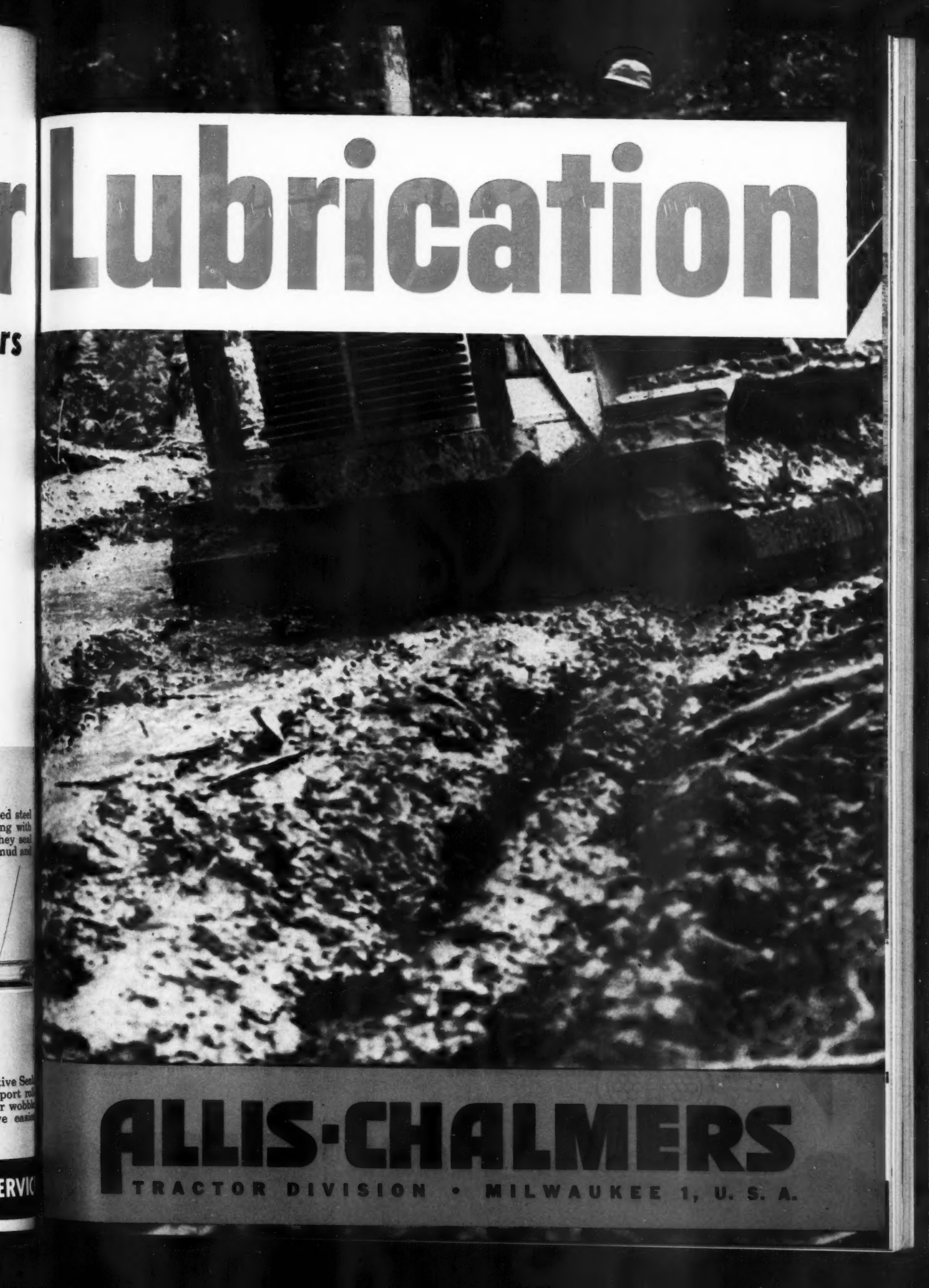


**Tapered Roller Bearings** protect the Positive Seal by letting truck wheels, idlers and support rollers rotate freely...without side thrust or wobble. Reduced friction lets the tractor move easier, produce more drawbar power.

## the newest finest tractor line on Earth!

HD-20 HD-15 HD-9 HD-5

**DESIGNED FOR YOUR JOBS • BUILT TO TAKE IT • EASY TO OPERATE • EASY TO SERVIC**


Lubrication
ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

**Buy Safe!** Don't gamble

on just any shuttle car cable—

you <u>may</u> lose

One break is trouble enough. Frequent breaks prove your cable faulty. Down time and repair losses soon mount higher than original cable costs. It's just common sense to buy the best in the beginning.

for longer "break-free" service insist on

This is AnacondA Securityflex Shuttle Car Cable. Note patented breaker strip and D-shaped insulation to prevent overriding. No other cable offers these plus features.



## Cold Rubber Insulated Securityflex

Almost any cable looks good when new. It's *service* that counts. ANACONDA Securityflex* portable power cable serves well through many, many hours of tough, rough use. There's a good reason why.

Cold rubber insulation—an ANACONDA First—is 50% more resistant to moisture than regular rubber. Special-strength neoprene jacket takes abrasion, heat, rockfall, and run-overs in stride where other types fail.

Securityflex functions nicely. Under reel tension, over guides, and in frequent sharp bends, it doesn't fatigue readily. It won't override, kink, or twist.

This ANACONDA Cable is safe—a look at the patented "anti-short" breaker strip and D-shaped insulation tells why. This is *plus* protection.

Write your nearest Anaconda Sales Office or Distributor for more information. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

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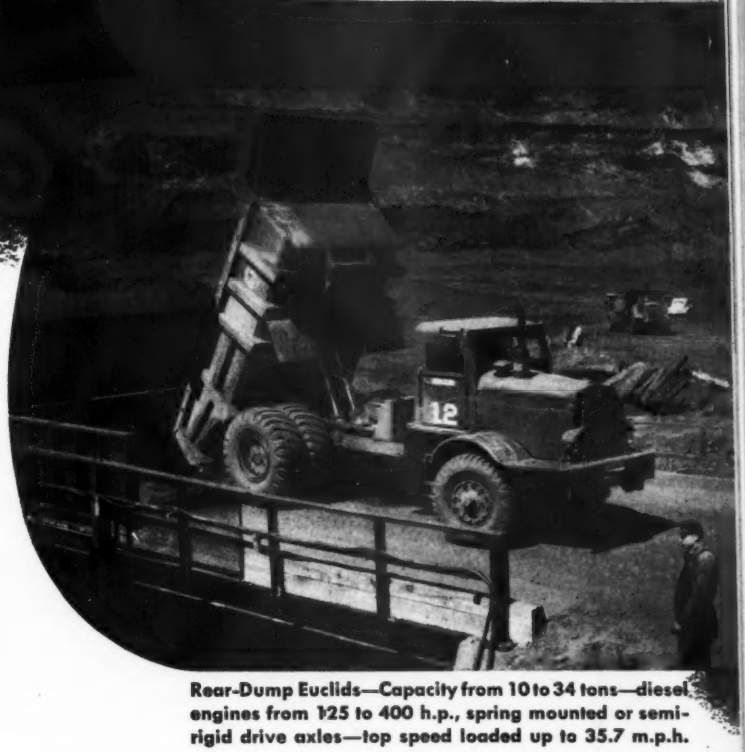
**the right cable for the job ANACONDA® wire and cable**

# "EUC" PERFORMANCE Pays Off

## IN MINES and QUARRIES



Rear-Dump Euclids—Capacity from 10 to 34 tons—diesel engines from 125 to 400 h.p., spring mounted or semi-rigid drive axles—top speed loaded up to 35.7 m.p.h.

"Eucs" are designed and built for moving coal, rock, ore, overburden and heavy excavation at the lowest cost. The simple but rugged construction of Euclids, combined with large capacity, ample power and speed, provide efficient off-the-highway hauling of practically any material.

Euclids are standard equipment in many leading open pit mines and quarries, and on construction and industrial work. Owners know that Euclid staying power and continuous operation result in more loads hauled in less time at lower cost.

Ask your Euclid distributor for data on quarry or open pit jobs similar to yours. There is a Euclid to meet your requirements for off-the-highway hauling work.

**MORE LOADS PER HOUR—**
**MORE PROFIT PER LOAD**

**The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohi**

EUCLIDS

# It's New!

## Le Roi-CLEVELAND

## S11ST Offset Telescopic Leg Stoper

# It's Fast!

**...and sized right**

**3 Sizes – 28" - 40" - 52" Feeds**

# It's Tough!

**Built *right* by the leading manufacturer of offset and roof-bolting stopers!**

S11ST Stoper lengths range from 23" closed to 86½" open.

**Only Le Roi-CLEVELAND S11ST gives you all these features for dependable, low-cost drilling**

★ Convenient right-hand feed control provides the right feeding pressure for fast drilling in any rock.

★ Trip rotation release allows piston to strike straight, hammer-like blows.

★ Feed leg supported at backhead and chuck housing for extra strength.

★ Fewer packings to replace in air-feed leg means less trouble, easiest servicing.

★ Button in handle provides fast, positive feed release, for quicker, easier steel changing.

★ Constant blowing around front end prevents slush and cuttings from entering drill at front end and greatly reduces wear.

★ Water tube can be removed quickly —you don't have to dismantle the machine, just take off the backhead plug.

★ Shielded safety handle protects operator's hands.

★ Air consumption is low.

Standard Le Roi-CLEVELAND S11 Offset Stopers can be converted to this new telescopic type.

So get set for faster drilling and lower costs — standardize on these new stopers. Write for complete details.

LE ROI

# LE ROI COMPANY

CLEVELAND ROCK DRILL DIVISION

12500 Berea Road, Cleveland 11, Ohio

BELT TRANSPORTATION WITH A GOODMAN ENDORSEMENT...

# Goodman

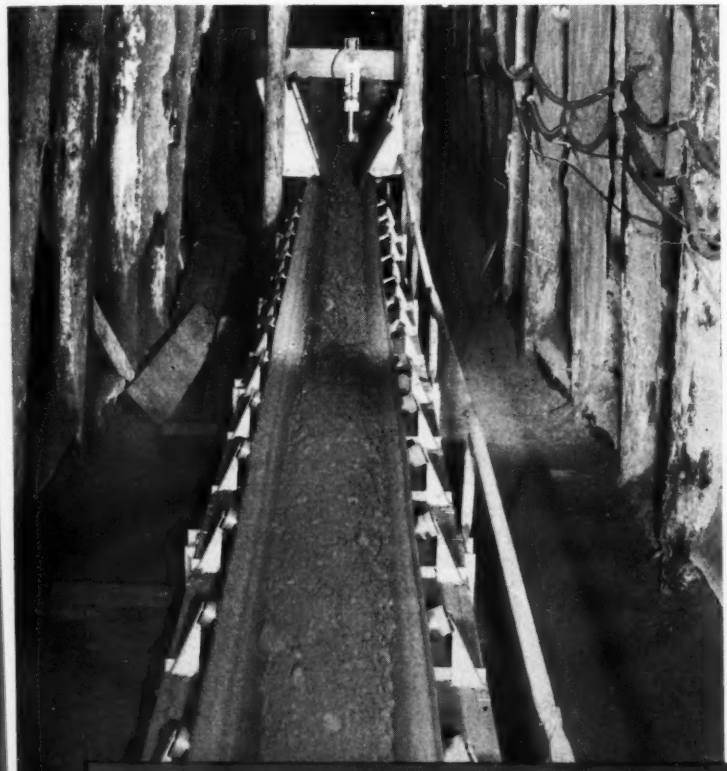
# TYPE 99 BELT CONVEYOR

PATENTED

## FOR HEAVY DUTY METAL MINE SERVICE

**When you buy a Type 99, the Goodman name, with its reputation for quality and "know-how" in the mining industry, assures you of complete satisfaction.** THE NAME PROTECTS THE PRODUCT!

**The Type 99 is 3-way engineered — from design to manufacture to installation. It is built especially for underground service with emphasis on compactness and portability.** THE PRODUCT PROTECTS THE NAME!



THESE ARE SOME OF THE TYPICAL ADVANTAGES FOUND IN THE GOODMAN TYPE 99:

1. Easily installed and extended
2. Accurate alignment at all times
3. No anchors required
4. Complete electrical units
5. The best in belting to meet the job

**Your inquiry for a *complete* conveyor engineered to suit your conditions is welcomed.**

Goodman MANUFACTURING COMPANY

HALSTED STREET at 48th • CHICAGO 9, ILLINOIS

CUTTING MACHINES • CONVEYORS • LOADERS • SHUTTLE CARS • LOCOMOTIVES

# Uncovering new

## AIRDOX • CARDOX

### NON-EXPLOSIVE MINING METHODS

*For* **Better Coal—Produced More Economically**

Note the clean, definite structure of this fall broken by AIRDOX.

THE POWERFUL, GENTLE GIANTS

New just a few years ago, AIRDOX today is a dominant production tool in the coal mining industry. In an ever-increasing number of mines AIRDOX has proved its ability to produce coal at lower cost per ton than other methods.

CARDOX has established a similar economy record over a period of *many* years.

*Either method* can help you to stabilize your costs at a lower level—and give you better, more marketable coal besides.

Both methods use the gentle but mighty force of compressed gases at the back of the drill hole. Both heave the coal out without the shattering impact of explosives. AIRDOX uses air to do the job, CARDOX uses carbon dioxide.

Which method is best for you depends upon many factors which can be determined by our engineers and yours. *The important thing* is that with either the benefits to *you* are many and positive.

*They include: greater loading efficiency at the working face—less damage to roof structure—less fines—easier cleaning with less loss—elimination of fires and explosions resulting from shooting—on-shift shooting in many mines.*

Ask to have a CARDOX Engineer survey your operations. He'll give you specific facts on dollars-and-cents savings that we think you will find very interesting. Write and we'll arrange a meeting.

# profits— in more mines every month!

## CARDOX-HARDSOCG *Underground* AUGER MINER

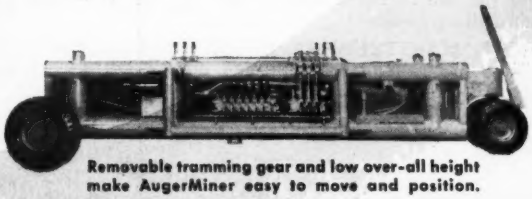
AugerMiner with coring-type cutterhead.

## *Takes* Volume Tonnage From Poor Roof Areas— at Low Cost per Ton

With a CARDOX-HARDSOCG Underground AugerMiner, you can go back for the coal you left behind you! Where poor roof conditions and excessive timbering costs prevent recovery by conventional methods, an AugerMiner drills back into thin or hard-to-reach seams and produces good coal at a cost usually far less than for your original working.

You have little or no development expense. The coal you get can be processed more cheaply because AugerMined coal contains no impurities from roof or bottom.

With an AugerMiner you have mechanized mining in its simplest, most efficient form. It is perfectly adapted to conveyorized loading. It is *safer mining* because the operators need never leave the areas where ample roof support can be provided at reasonable cost.

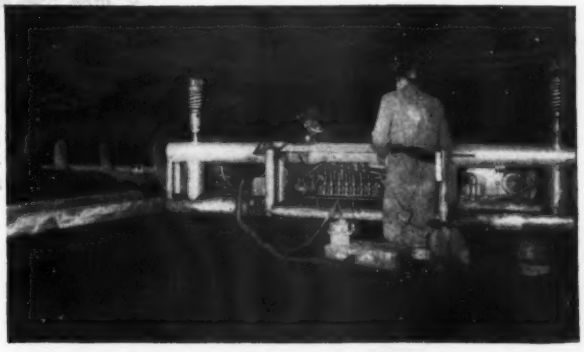


Removable tramming gear and low over-all height make AugerMiner easy to move and position.

A 25 H.P. AugerMiner drills holes up to 30" in diameter. Augers are added in 6-ft lengths in just a few moments, up to a total "reach" of 100 feet. Larger AugerMiners to handle augers up to 36" diameter will be available soon.

Write us to have a CARDOX Engineer give you the facts on what AugerMiners are doing in other mines—and what you can reasonably expect in your own. Meanwhile, ask for our new AugerMiner Bulletin.

Operator's side. Operator controls built-in hydraulic roof jacks. Auger retriever removes augers from hole quickly and easily. Vertical directional control keeps auger in seam, away from impurities.



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for

production without additional manpower

**Ingersoll-Rand**

## CARSET JACKBITS

*offer you all these time saving, labor saving advantages for faster easier rock drilling in practically every type of ground*

**CARSET JACKBITS WEAR LONGER**—because they retain their Tungsten Carbide cutting edges after drilling many feet in the *hardest rock.*

**INCREASE DRILLING SPEED 50% OR MORE**—because they maintain their original high drilling speed for the full depth of the hole.

**BOOST TONNAGE 20% OR BETTER**—because they permit drilling deeper holes and pulling longer rounds. This means more rock or ore broken per shift.

**PRACTICALLY ELIMINATE BIT CHANGES**—because gauge wear is negligible and uniform diameter holes can be drilled to any practical depth.

**SAVE UP TO 30% ON DYNAMITE**—because they eliminate tapered holes, permit smaller hole diameters, and concentrate more dynamite in the bottom of the hole.

**CONSUME UP TO 50% LESS DRILL STEEL**—because the smaller average size, sharper-edged bits drill easier and are kinder to drill steel.

**REDUCE AIR CONSUMPTION AT LEAST 40%**—because they permit the use of lighter drills, smaller diameter holes and much higher drilling speeds.

**REDUCE MAINTENANCE COSTS 30% OR MORE**—because they lighten the load on drills and equipment, greatly extending the service life between overhauls.

**Ingersoll-Rand**

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CARSET JACKBIT

# SUPERLA

REG. U. S. PAT. OFF.

## Mine Lubricant No. 0

## Cutting . . . lubrication troubles

● Operators of this midwest mine depend on SUPERLA Mine Lubricant No. 0 for trouble-free lubrication, not only in the gear cases of their three cutters, but in the transmissions of two Goodman loaders as well. This one lubricant, recommended by a Standard Oil lubrication specialist, does both jobs with equal success, and simplifies stocking of lubricants at the mine.

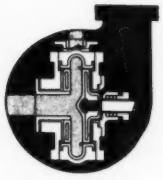
In three years of operation with SUPERLA Mine Lubricant there have been no cases of downtime of loaders or cutters due to faulty lubrication. Wear has been held to a minimum. Warm-up time for the loaders has been eliminated.

SUPERLA Mine Lubricant has cut lubrication troubles in this mine . . . it can do the same in your mine. There's a Standard Oil lubrication specialist located near you who knows mining equipment and how to lubricate it best. He is at your service for on-the-job help on any problem related to lubrication. Why not call on him today? Just contact your nearest Standard Oil office, or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

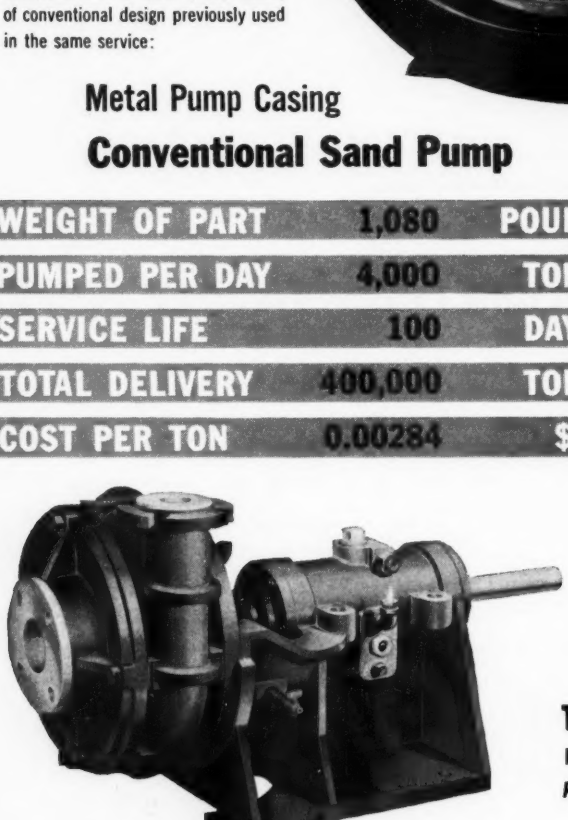
**STANDARD OIL COMPANY** STANDARD *(Indiana)*

# Let's look at the record

This unretouched photograph shows the Maximix Rubber Shell Liner from a Hydroseal Sand Pump after it was taken from service. Here's how it compared with a metal pump casing of conventional design previously used in the same service:



| | Metal Pump Casing<br>**Conventional Sand Pump** | | Maximix Rubber Liner<br>**HYDROSEAL Sand Pump** | |
|---|---|---|---|---|
| WEIGHT OF PART | 1,080 | POUNDS | 105 | 90% LESS |
| PUMPED PER DAY | 4,000 | TONS | 11,000 | 175% MORE |
| SERVICE LIFE | 100 | DAYS | 340 | 240% LONGER |
| TOTAL DELIVERY | 400,000 | TONS | 3,740,000 | 835% MORE |
| COST PER TON | 0.00284 | $ | 0.000065 | 98% LESS |



Results like this explain why Hydroseals are the choice of cost-conscious milling engineers the world over. Find out how their economy and efficiency can help you solve your pumping problem. Write for Catalog No. 451 today.

**THE ALLEN-SHERMAN-HOFF PUMP CO.**
**Dept. K — 259 E. Lancaster Ave., Wynnewood, Pa.**
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# HYDROSEAL

**SAND, SLURRY & DREDGE PUMPS**
**MAXIMIX RUBBER PROTECTED**

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

## Material on Mining Bits

Proper instructions, vitally important to the correct use of carbide tools are available on mining machine bits, coal auger bits, strip bits, and rock bits. They are thorough, time-tested, and reliable. Write Kennametal Inc., Latrobe, Pa., pioneers and world's largest manufacturers of cemented carbide mining tools.

A complete tool catalog is also available that gives specifications, prices, and performance data on Kennametal Mining Tools. Specify M-6. Any of the above material will be sent to you on request.

•

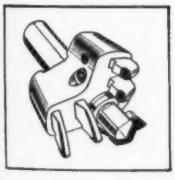
## New Bit Rotary Drills Bolt Holes in Laminated Sandstone

***Drills hundreds of feet in hard roof***

To give the greatest wear resistance in drilling hard roof, the Kennametal HFD Bit is tipped with a thick insert of Kennametal cemented carbide. The bit fits into regular Kennametal Roof Bolting Rods. It is powered by ordinary electric drills. Material drilled with the bit is slate, shale, and laminated sandstone. The four main features of the bit are: (1) Smoother hole without rifling, (2) Longer gage life in hard roof, (3) Easy bit sharpening, (4) Lower bit cost than obtainable with any other bit used for drilling medium hard mine roof. Sizes are 1¼-inch to 2¼-inch, prices range between $4.85 and $14.80, depending upon size and quantity.

•

## Machine Bits Bore Rock



Six regular mining machine bits act as cutting teeth in this rigidly constructed bit used for rock boring. The "teeth" are set in a heavy cast steel head. They are secured by set screws which allow them to be removed for sharpening when dulled. Drilling speeds are 3' to 3½' per minute in average drilling. Feature: Ability to drill hard rock formations. Style is UD 6½". The price, including bits, is $45.10 to $59.40 depending upon quantity.

**Two things make it possible for a bit to achieve a fortieth life. One is its high quality Kennametal tungsten carbide cutting edge and another is the kind of maintenance that is given to it. Poor or improper maintenance is, in most instances, the reason for early fatality. Is your Kennametal Bit changed when it gets dull? Is it reground according to recommended sharpening methods? If not, then a forty-life bit is improbable, and cost sacrifices are made in terms of lower drilling speed, higher drill maintenance cost, higher bit cost.**

**Under average drilling conditions, where the drilling is largely done in coal with only minor quantities of impurities, the Kennametal Drill Bit can, if properly cared for, give 4,000 feet or more of service or a hundred or more feet of drilling per sharpening. If your performance is less, it may be advisable either to look carefully yourself to be sure the right precautions are being used or better, ask your Kennametal representative to give your procedures a once-over. He knows from daily experience the ways in which bit service can be improved. The way to get maximum life, 40 lives if you're in average coal, is to remove the bit when dull, sharpen it as per the instructions that are prescribed by your Kennametal representative. Kennametal Inc., Latrobe, Pa.**

***Names and addresses of Kennametal representatives appear in your 1951 McGraw-Hill Mining Catalog.***

**GRINDING INSTRUCTIONS**

**For the best service life on your tungsten carbide mining tools, they should be reconditioned at regular intervals and according to proper procedures. Conserve bit life by following proper grinding techniques. Write today for a copy of our complete, fully-illustrated folder on proper bit maintenance.**

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**DRILL BITS • MACHINE BITS • ROCK BITS • ROOF BITS**

***Bits for Every Cutting & Drilling Need***

# *New* JEFFREY 56-RD ROOF DRILL

(Patent Pending)

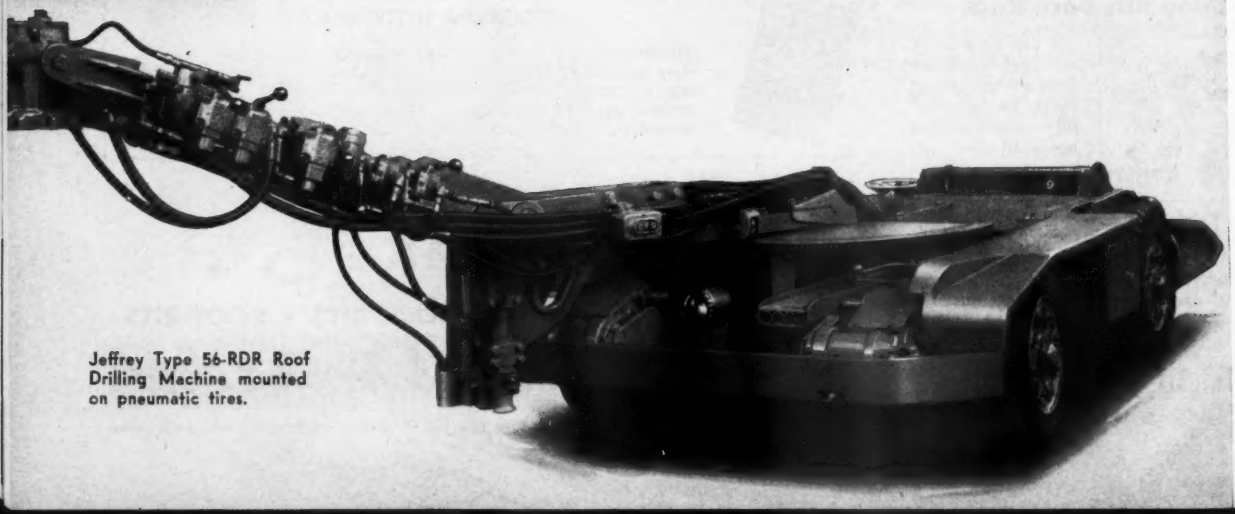
## SPEEDS UP ROOF-BOLTING OPERATIONS

● The New Jeffrey 56-RD Roof Drill features a specially designed Arm, hydraulically operated and mounted on either a self-propelled track type or rubber tired truck . . . provides a reach of 10 ft. 10½ in. each side of center line of machine.

Straight-line feed for the auger and parallelism to its starting position are maintained by means of cams which shorten and lengthen the Drill Arm and make the necessary angular adjustments as Drill is fed upward.

The drill head includes maximum torque power wrench (see inset on other page) for tightening the roof bolts.

If you want to cut costs in Roof Drilling, give our engineers a chance to explain the Jeffrey Roof Drill in detail. Write today.



Jeffrey Type 56-RDR Roof Drilling Machine mounted on pneumatic tires.

Right—close-up of the Jeffrey Roof Drill showing the torque wrench in use for anchoring and tightening bolts.

Large view above shows the Jeffrey Roof Drill at work. Operator has the auger in the socket and is drilling a roof hole. Water, introduced at drill chuck is carried through drill rod to drill bit in the hole to prevent dust.

# The Jeffrey Manufacturing Company

958 North Fourth Street, Columbus 16, Ohio

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| Cutters | Chains | Continuous Mining Machines | Conveyor Loaders |
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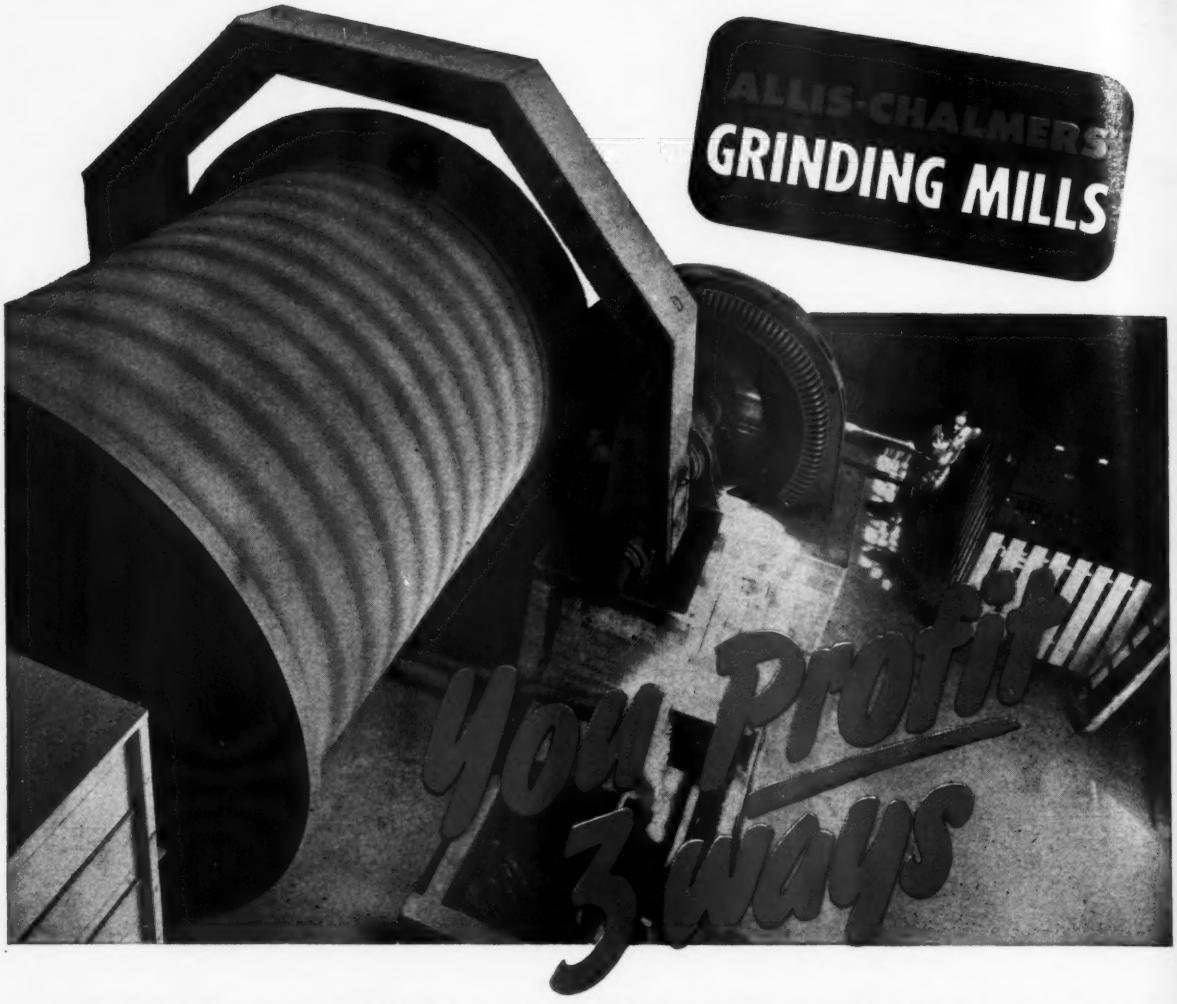


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**1** **YOU CAN BE SURE** of getting a grinding mill specifically suited to your requirements. A wide range and multiple combinations of types and sizes assures this . . . assures top, economical performance year in, year out.

**2** **YOU GAIN** the seasoned benefits and *unequalled* experience accumulated through the successful installation of more than 4200 Allis-Chalmers mills over a period of 70 years.

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*Pulverator* is an Allis-Chalmers trademark.

**NEW** 44-page grinding mill bulletin 07B6718A is chuck full of valuable tables and grinding mill information. Get it from A-C representative in your area or write Allis-Chalmers, Milwaukee 1, Wis. A-3706

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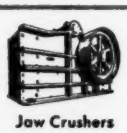
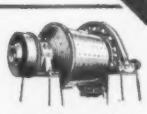
*Pulverator*

Gyratory Crushers


Jaw Crushers


Grinding Mills

Vibrating Screens

Kilns, Coolers, Dryers

# IS YOUR COAL HAULING SYSTEM STRICTLY A "ONE WAY" STREET?

**a.C.f.** Mine Cars haul timbers, men and supplies into the mine on the identical cars that take the coal out! With the same locomotive, tracks, maintenance crew and equipment, **a.C.f.** 'Constant Haulage' mine cars handle both jobs for the price of one!

In addition, with mine cars, repairs don't mean shutdowns. If a mine car needs repairs, it goes off onto a siding... the rest of your trip continues to roll.

Whether you're planning a new haulage system or overhauling an old one, why not let an experienced **a.C.f.** Representative show you all of the tremendous advantages of **a.C.f.** 'Constant Haulage' mine cars?
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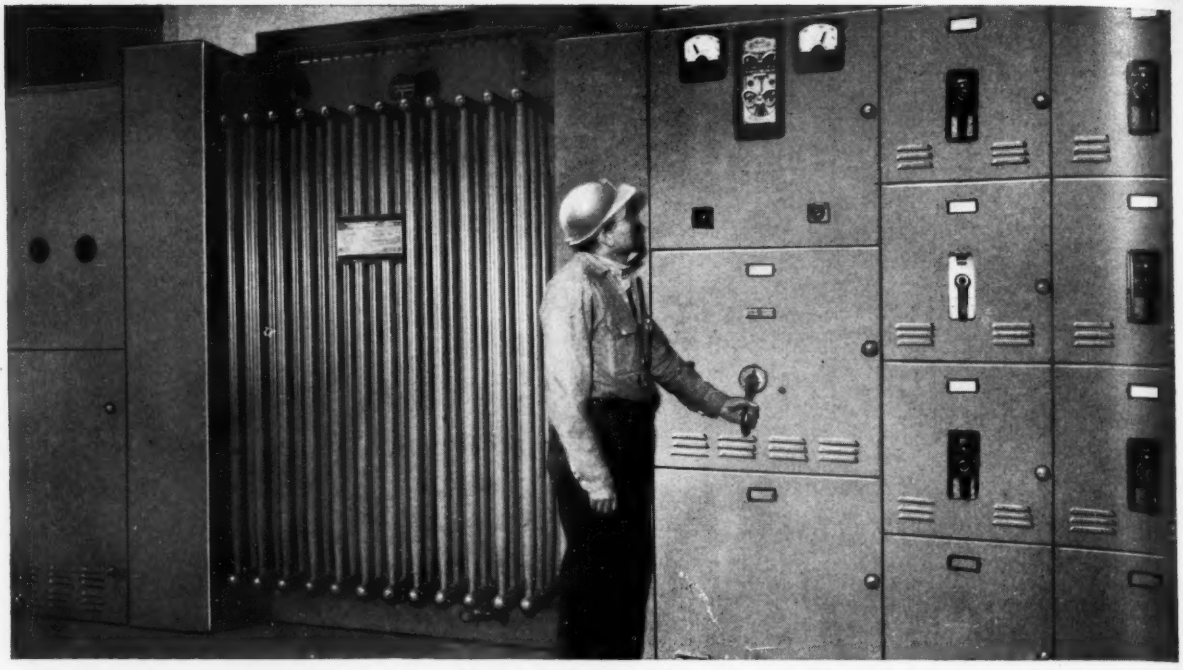
**a.C.f. MINE CARS**

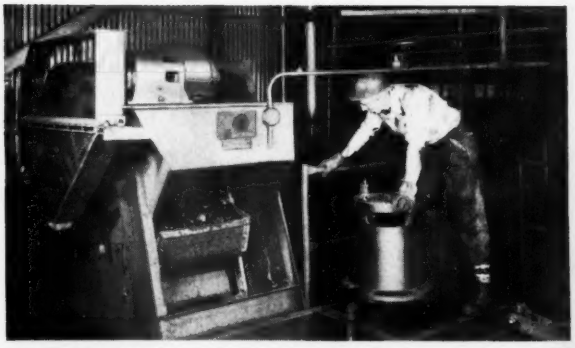
*for Constant Haulage*



**G-E LOAD-CENTER UNIT SUBSTATIONS,** co-ordinated into a load-center distribution system by skilled G-E application engineers, provide an easy way of supplying power at the right voltage where it's needed, for greater efficiency.

# G-E system engineering helps

**G-E GROUPED CONTROL** centralizes control of various sets of motors. Interlocks and timers permit sequence operation.



**G-E TRI-CLAD* GEAR MOTOR** (shown driving a secondary refuse elevator) requires little more space than standard motor.

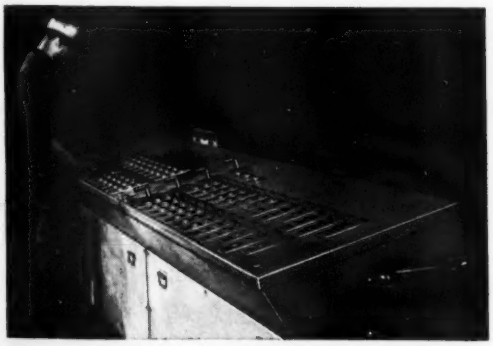
**G-E TOTALLY ENCLOSED FAN-COOLED MOTOR** (shown driving conveyor) is protected against damage from coal dust.

*Registered trade-mark of General Electric Co.

**G-E METAL-CLAD SWITCHGEAR,** incorporated in this plant power system, contains incoming line and feeder breakers selected to assure adequate interrupting capacity. Units are shipped assembled to save installation time and cost.

# keep clean-coal output high

## G-E application engineers can help plan your electrical system to speed startups, cut power costs, assure production continuity



**G-E MASTER CONSOLE DESKS**—the heart of the control system—centralize all pushbutton stations and indicating lights in one convenient location.

General Electric application engineers can serve you most effectively while you're still in the planning stage. Familiar with your industry's needs, they work closely with your engineers. Together, these skilled technicians select the right G-E electric equipment that will best match the rated capacity of your plant.

Moreover, this equipment is co-ordinated into a complete, reliable electrical system. It will be responsible, to an important degree, for keeping your plant equipment on the job . . . for boosting power factor and lowering power costs . . . for reducing manpower requirements through automatic control.

Call in G-E application engineers early—when you first start planning. That way, you'll be assured of a more efficient electrical system. *General Electric Co., Schenectady 5, N. Y.*

663-24

**Engineered electrical systems for coal preparation plants**

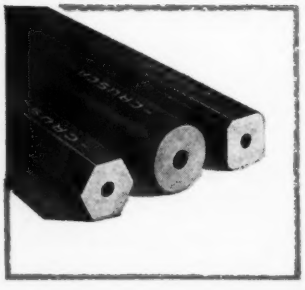
**GENERAL ELECTRIC**

# ON TOP

*or*

# UNDERGROUND

*it's*
*CRUCIBLE*
*HOLLOW*
*DRILL STEEL*
*all the way*



Whether driving a tunnel or clearing a mountain pass — tough Crucible Hollow Drill Steel gets the job done better, faster — at lower cost per foot drilled. This quality steel is built to take the punishment of around-the-clock operation of modern, high air-pressure rock drills. And you have the assurance of minimum breakage . . . and an end to expensive bit loss.

That's because of Crucible's rigid *pre-testing* of every *lot* of Crucible Hollow Drill Steel. What's more, Crucible Hollow Drill Steel is backed by the experience of quality steelmakers. Then too, field metallurgists with broad background on *your* job are available — should you need them.

Insure the quality of your job — cut costs — use Crucible Hollow Drill Steel.

**CRUCIBLE** first name in special purpose steels

*52 years of Fine steelmaking* **HOLLOW DRILL STEEL**

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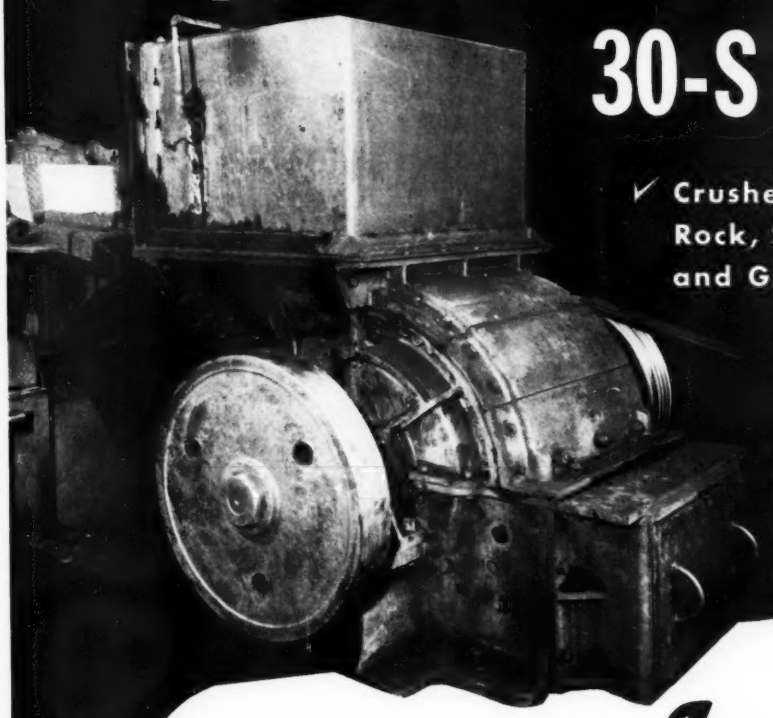
REX HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

# NEW *American* HEAVY-DUTY 30-S CRUSHER



✓ Crushes ROM Coal Rock, Slate, Sulphur Balls, and Gob . . . *without oversize*

✓ Saves Labor Costs of Pickers

✓ Saves Coal

## THE HEAVY-DUTY *American* PAYS OFF FOR THESE 3 MINES:

- **CRESCENT COAL CO., Central City, Ky.** "We have not spent a cent on this crusher since installation," writes the General Manager. It has eliminated two pickers . . . recovers coal previously thrown away on account of impurities. By crushing and washing, this coal is salvaged. Estimated average of 280 tons of coal and "gob" go through crusher every day. "In 18 years' experience with American Crushers, we know it is the most economical and ideal crusher for our operation."

- **PERRY COAL CO., O'Fallon, Ill.** Previous crusher required three men at the picking table, according to the Mine Superintendent. Today, only one operator is needed to remove wood and tramp metal. No replacement parts have been needed . . . recent inspection showed no signs of wear after 16 months' operation at a daily operation of 210 tons for 7" plus ROM coal. This Heavy-Duty American is one of five Americans installed at this mine.

- **SOUTHWESTERN ILLINOIS COAL CO., Percy, Ill.** "The Mine reports that the installation of the American Pulverizer #30-S crusher has been an excellent labor-saving device. In the 12 months of operation the crusher has had no parts replacements. Continued inspection and past American Crusher history indicate the maintenance of this crusher will be a very small item. Approximately 320 tons of coal per day go through this crusher."

● Let American show you how you can profit by a 30-S Heavy-Duty installation. We welcome your inquiries.

*American* **PULVERIZER COMPANY**

*Originators and Manufacturers of Ring Crushers and Pulverizers*

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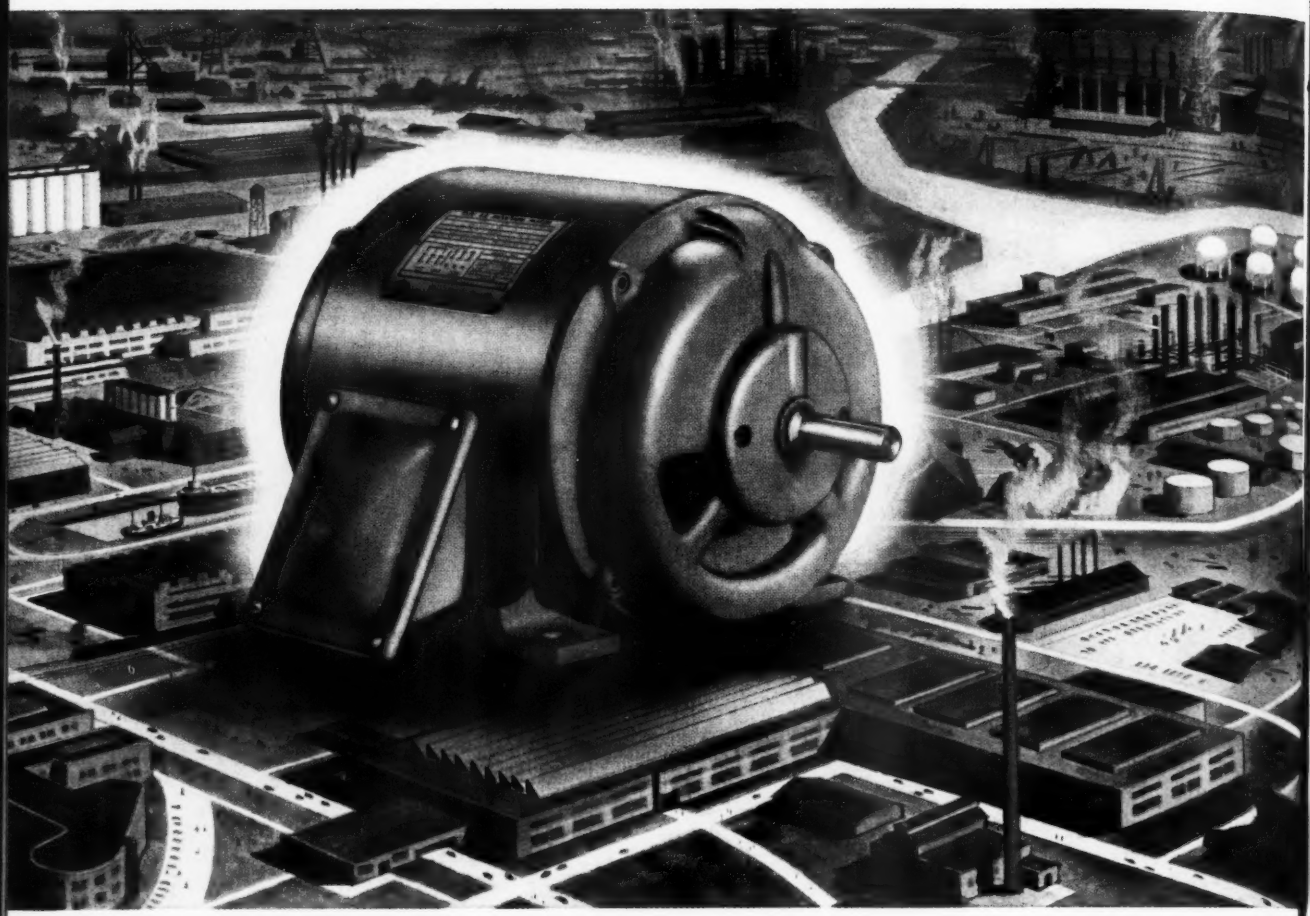

# Everywhere in Every Industry, this Fact is Being Proved...

## *"All Motors are not alike"*

By their superior performance—frequently in rugged 24-hour-a-day service—Reliance Precision-Built A-c. Motors are proving in every industry that *"All Motors are not alike"*. Here are motors which are made differently and made better—to deliver dependable power longer. Their original factory bearing lubrication, for example, provides more operating hours before re-lubrication is necessary than that of any other pre-lubricated bearing. And on the next page you will find a check list of features which combine to make the Reliance design the best pre-lubricated bearing design you can obtain in any motor made today!

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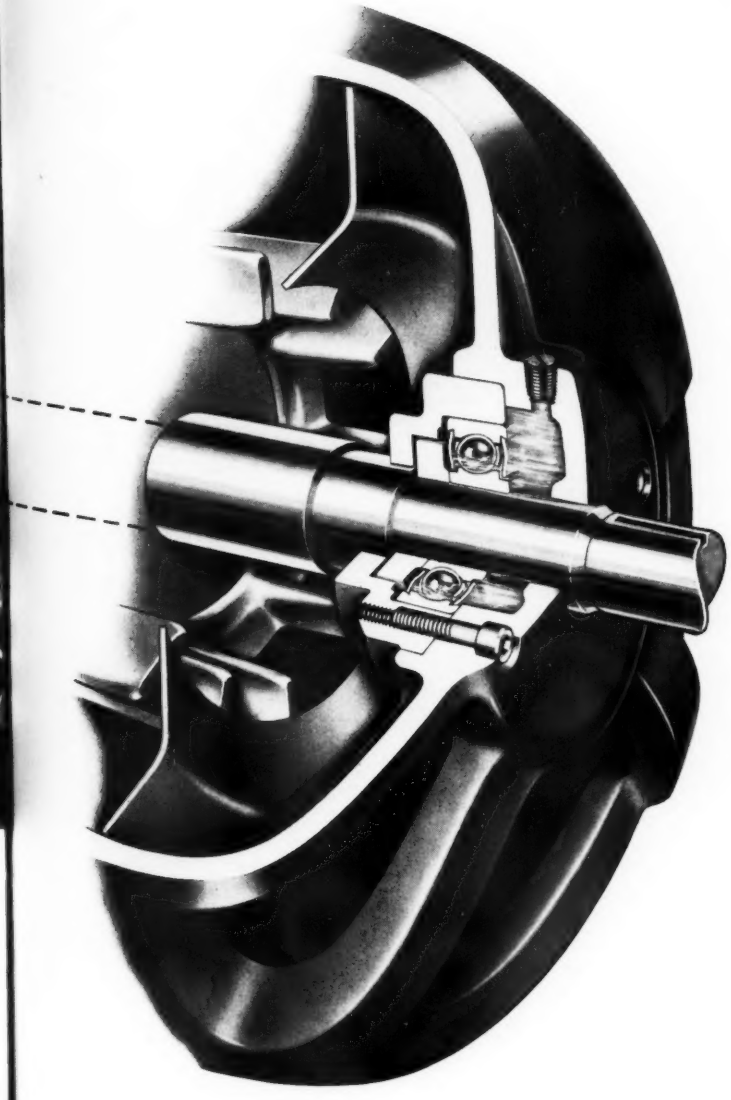
## 15 REASONS WHY . . .

# the RELIANCE Pre-Lubricated Bearing Design

## is the BEST in Electric Motors



- Bearing sealed from dirt and other foreign material.
- Enclosed bearing housing.
- Bearing can be re-lubricated without being disassembled.
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- Automatic grease relief to suit any lubrication system.
- Protection against grease entering windings.
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- Bearing can be removed without danger of distortion.
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- Standard commercial ball bearings.
- Larger grease reserve than provided with any standard bearing.
- Grease supply free of churning action.
- Measuring unnecessary to prevent over-greasing.
- Unnecessary to grease equally at each side of ball race.
- Lubricant is retained in ball race.

**Write for Bulletin detailing all of the advantages you get with the RELIANCE Pre-Lubricated Bearing Design**

Cutaway views, comparison chart and statements by bearing manufacturers offer more complete evidence of the superiority of the Reliance Pre-Lubricated Bearing Design. Specify Bulletin B-2201.

***Reliance PRECISION-BUILT A-c. Induction Motors available from 3/4 to 300 horsepower***

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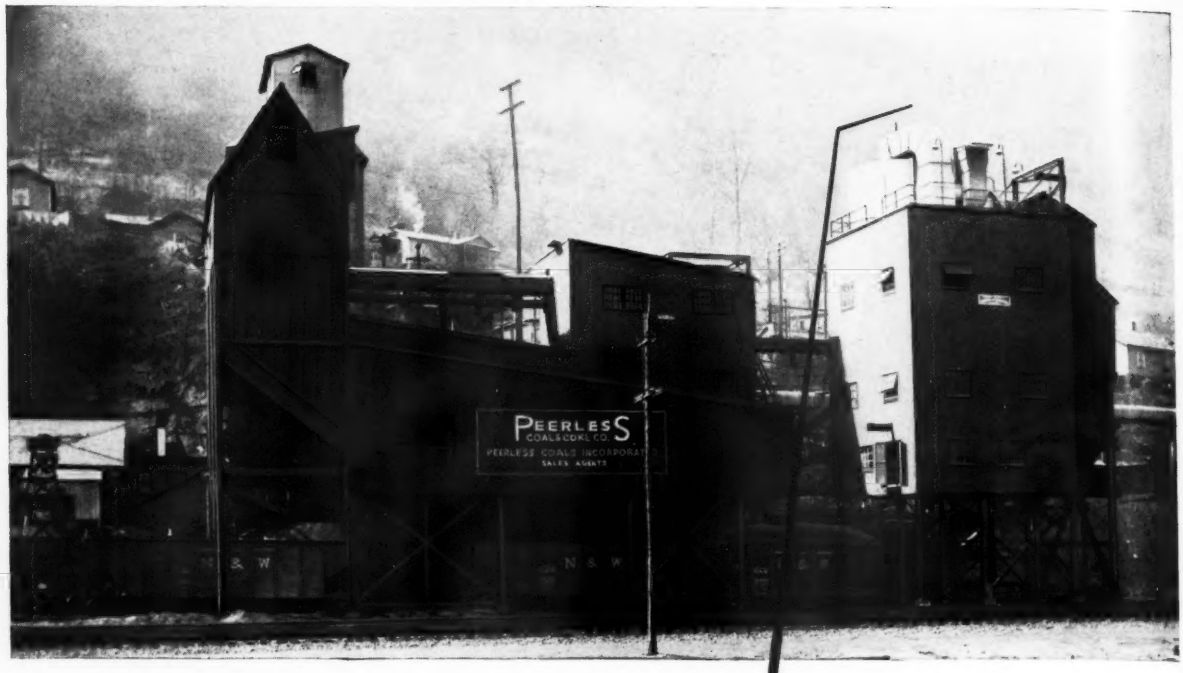


Recently completed addition to Peerless Coal and Coke Company plant, Vivian, West Virginia. Engineered and constructed by Roberts & Schaefer Company.

# R&S COMPLETES "Operation Modernization" AT PEERLESS

Completion of the new plant addition shown here is the latest step in the "Operation Modernization" that began at Peerless Coal & Coke Company twenty-five years ago.

This latest R&S-engineered addition is built around R&S Super-Airflow units designed to air-wash fine coals. Thus, it compliments the original R&S-engineered plant and other R&S-engineered additions which have done a highly successful job of wet-washing larger sizes.

With this installation, Peerless joins with other progressive operators who have accepted the Roberts & Schaefer Co. system of combination water- and air-washing plants. The annual installed capacity of Roberts & Schaefer Hydro-Separators and Airflows now totals 50,000,000 tons.

Whether wet-washing or air-washing is the answer to your preparation problem—or whether the answer is heavy-media separation or some other process—you are assured of authoritative, unbiased counsel when you consult Roberts & Schaefer Company.

An ever growing list of repeat customers like Peerless is your assurance of complete satisfaction.

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Mining CONGRESS JOURNAL

*Published for the Entire Mining Industry*
*by the AMERICAN MINING CONGRESS*
JOHN C. FOX, Editor

VOLUME 38 JUNE, 1952 NUMBER 6

## Coal Marches On

ALMOST 100 years ago Ralph Waldo Emerson wrote that Coal is power and civilization. He went on to say: "It is portable climate. It carries the heat of the Tropics to Labrador; and is the means of transporting itself wherever it is wanted. It makes Canada as warm as Calcutta and with its warmth brings industrial power."

Even so great and brilliant a mind as Emerson's could hardly have realized the prophecy in those words.

America has been endowed by Nature with almost limitless supplies of this solid energy. Through the years, the United States Coal Industry has grown from the laborer with pick and windlass to the most highly mechanized, most efficient and productive in the world. This it has done solely on the initiative of the men who worked in the American atmosphere of Free Enterprise.

Competition is keen and he who would not fall by the wayside must keep fully informed at all times. American coal mining men know this, so each one is intensely interested in keeping abreast of the latest developments. As evidence of this, witness the splendid attendance at the American Mining Congress Coal Convention recently held in Cincinnati. A report of this meeting appears elsewhere in this issue and the full proceedings will appear in the 1952 issue of Coal Mine Modernization.

At the convention American Coal Mining was on parade with all its know-how and technical progress. Mining men are well aware that each can achieve greater efficiency, safety and economy through the cooperative give and take of honest reporting and frank discussion of all problems. This attitude, so characteristic of American mining men, is a heritage from the Town Meeting and has contributed no little to the supremacy of the industry.

It is at meetings such as this that one sees unrolled the achievements of the past and present and the outlook for the future. As the convention sessions marched by, each observer was proud to be a part of this parade of an industry that has already done so much for the world and has its sights set so high for the future.

## Nationalism, U.S.A.

EARLY in May dispatches from La Paz, Bolivia, apprised the world that President Victor Paz Estenssoro had told a "Nationalist Day" meeting that nationalization of the mines would be carefully studied and carried out at any cost. Another spokesman for the Bolivian government said that the present cabinet sought only to maintain its independence of Moscow, Buenos Aires and Washington. Since the medium and small mines are Bolivian owned already, it is evident that the government has in mind the expropriation of the larger tin mines owned by non-Bolivian interests.

While it is true we cannot hope to produce enough tin domestically to meet our own needs, there are other mineral commodities that we now import which could be produced here in ample quantities, given a favorable atmosphere. The philosophy which prompted this outbreak of expropriation fever in Bolivia could easily spread so as to shut us off from supplies of these other minerals.

It was to minimize this possibility that Frank Ayer urged, at the American Mining Congress meeting in Los Angeles last fall, that no time be lost in getting our own deposits of metals and minerals into production, "safe from sinking by bombers or submarines, safe from Communist domination, safe from foreign confiscation and immediately available in times of national emergency."

While the wires were still hot with the news from Bolivia, another blow was struck at our metal lifeline. Chile terminated her agreement with the United States whereby 80 percent of her copper production was to go to this country at 27½ cents a pound, and announced that hereafter all Chilean copper would be for sale in the world market.

As a result, a new agreement has been reached with the Chilean government. Under its terms consumers in the United States will be permitted to purchase copper in the world market at prevailing prices. They may receive price relief from OPS based on 80 percent of the excess paid over and above the 27½-cent price provided in the previous Chilean agreement. However, it continues to be the policy of the U. S. Government not to undertake now, and to avoid in the future, changes in existing price ceilings of domestically mined and refined copper, brass mill scrap or copper and copper alloy scrap.

Wouldn't it be better and safer, as Mr. Ayer urged, to get domestic companies with fully developed reserves into production? Once under way they will add large tonnages to domestic supplies. They will, for years, employ large numbers of men and be great assets to their districts, their states and to our nation.

Support is carried right up to the face where most accidents occurred

Bolts are installed at the heading from the drill platform

# Roof Bolting In Tunnels*

## Where Applicable, Method Lowers Costs and Increases Safety; But It Is Not A Cure-All

By PHILIP S. MILLER

Civil Engineer and Consultant
West Orange, N. J.

IN recent years, the ever increasing cost of labor and material has forced contractors and engineers constantly to seek cheaper, more efficient, and speedier ways to perform their jobs. This is, of course, true of all industry, but probably in no other field is the matter of cost reflected so sensitively as in the construction industry. In the field of contracting, the mass-movement of earth and the driving of rock tunnels have presented the most fertile field for ingenious mass-production improvements.

In driving a rock tunnel, a more or less rigid sequence of operation is generally followed:

(1) Drilling
(2) Blasting
(3) Mucking
(4) Erection of roof support

As necessary adjuncts to the above we may include also:

(1) Ventilation
(2) Transportation
(3) Hoisting

In each of the above categories, with the exception of roof support, developments during the past 25 years have been most spectacular. The development of improved automatic drills and jumbos, the use of storage-battery and diesel locomotives, and more efficient blasting materials and procedures have reduced the time interval for the performance of any one of the above components. Improvements in mucking equipment, development of hard tipped bits, and advancement in wet drilling and ventilation practices have all contributed to cheaper costs and better safety conditions.

### Roof Support Progressed

In the matter of roof support, the use of steel sets was a great step forward from the old timber sets. However, because the supporting of tunnel rock is such an empirical art, subject to a large extent to the whims of judgment of the "Practical Tunnel Man," progress in this aspect has lagged far behind the purely mechanical improvements. This is indeed unfortunate because by far the greatest number of accidents in tunnels are caused by rock falls. Furthermore, the methods and design of the roof support so materially affect the other factors in tunnelling that it would be assumed that this phase should have undergone greater scrutiny long ago.

Strangely enough, it took a national crisis (a shortage of steel) to provoke the first major improvement since the introduction of steel to support the roof. With steel in short supply, several large tunnel projects have found it necessary to resort to roof bolting to keep going. Because of exceptionally good results, the practice is now accepted generally as standard procedure. This is indeed a tribute to the method in view of the long-standing opposition to its use.

* Based on a talk given before the National Safety Council Meeting, Chicago, Ill.

## A Note of Warning

However, the enthusiasm evoked by roof bolting may generate its own defeat unless its use is tempered with good sense and sound judgment. It is by no means a panacea for all roof conditions and its use carries with it the obligation of far more vigilance than is normally exercised by tunnel men. Just as the discovery of penicillin and the anti-biotics have opened a new era in medicine, although by no means offering the universal cure for all the ills to which man is heir, so, too, must roof bolting be viewed. In its place it is an excellent adjunct to safer and speedier tunnel construction, but it is certainly not the answer to all roof problems.

The origin of suspension type of roof support is obscure. The actual development of the present method of roof bolting was performed in a large measure by the St. Joseph Lead Co. over a period of 25 years. Yet, even with its demonstrated efficiency, it was generally frowned on by most mining and tunnel men. Probably this was due to its apparent resemblance to using "sky hooks." In the mining industry, no important use of roof bolting occurred until about 1947, when, because of the increased cost of labor and timber, and continued progress in mechanical mining, together with the aggressive stimulus of the U. S. Bureau of Mines, the method caught on and its growth since has been phenomenal. In the tunnel industry, the extensive use of roof bolting probably started at the Keyhole Dam Diversion Tunnel in 1950. There, because of a shortage of steel, the Bureau of Reclamation permitted the contractor to employ roof bolts. The highly successful results obtained at Keyhole encouraged the New York City Board of Water Supply to permit the use of suspension type supports at the East Delaware Tunnel, currently being constructed by the Walsh Construction Co. and B. Perini & Sons, Inc.

The East Delaware Tunnel consists of 26 miles of deep rock tunnel with a driven diameter of about 13 feet. It is a project of such magnitude that techniques and procedures have had ample opportunity to develop. Roof bolting is now firmly established as routine practice.

Literature in the field of roof bolting is so voluminous and the manufacturers of the bolts have performed such a good job in disseminating information on installation, that it is not necessary to go into any detailed discussion on theory or practice. Rather, this will be a discussion of the practical aspects of the problem including benefits accruing and costs of installation. The usual contractor is a pragmatic fellow and is concerned mostly about such matters.

**Bolts make roof self supporting**

Briefly, the effect of roof bolts is to bind together a series of independent and thin strata into a single homogeneous beam, thus resulting in a thicker member with greater resisting moment. Its second function is to transfer the load to a more substantial strata above by suspension rather than by direct bearing as in the case of conventional posts. Furthermore, it follows from the above that whereas ordinary timber sets come into play after failure has occurred to the rock, the roof bolts cause the rock to contribute to its own support.

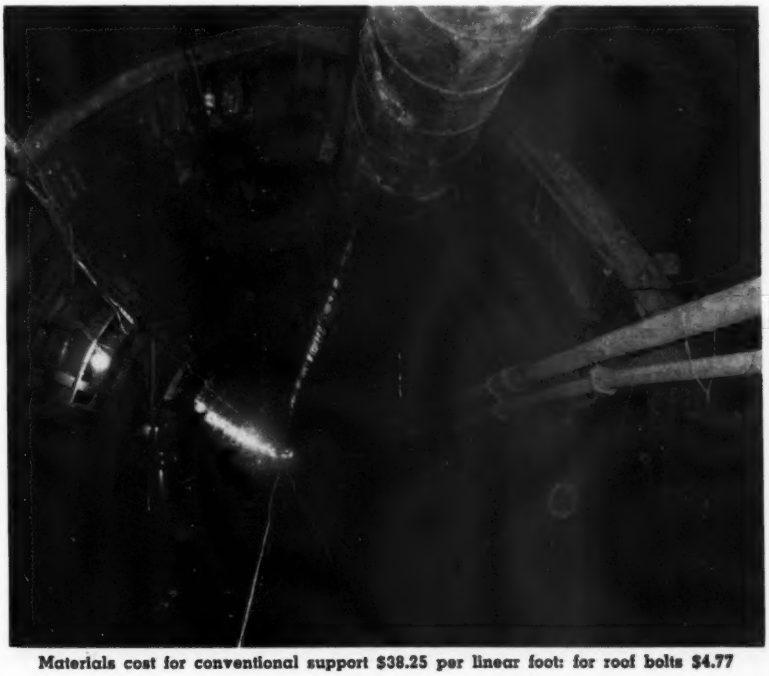
There are a number of types of roof bolts available, including the expansion shield type. In the tunnel industry the most generally employed type is the one-in. steel rod, threaded at one end and slotted at the other. The slotted end is provided with a ¾ by ¾ by 5½-in. tapered wedge for expansion. The overall length of the bolt is about 6 ft.

At the Keyhole Dam Tunnel, bolts were used with a ⅜ by 8 by 8-in. plate at the collar of the hole. At the East Delaware project, however, the practice has been to use a 4 ft long, 6-in. channel with a bolt at either end or more recently, to employ a 9-ft long mine tie held in place by four 6-ft long-wedge-type bolts. These ties are spaced at about 30-in. centers across the tunnel roof and extend longitudinally with the tunnel axis. Generally, four to five ties are required at any given section.

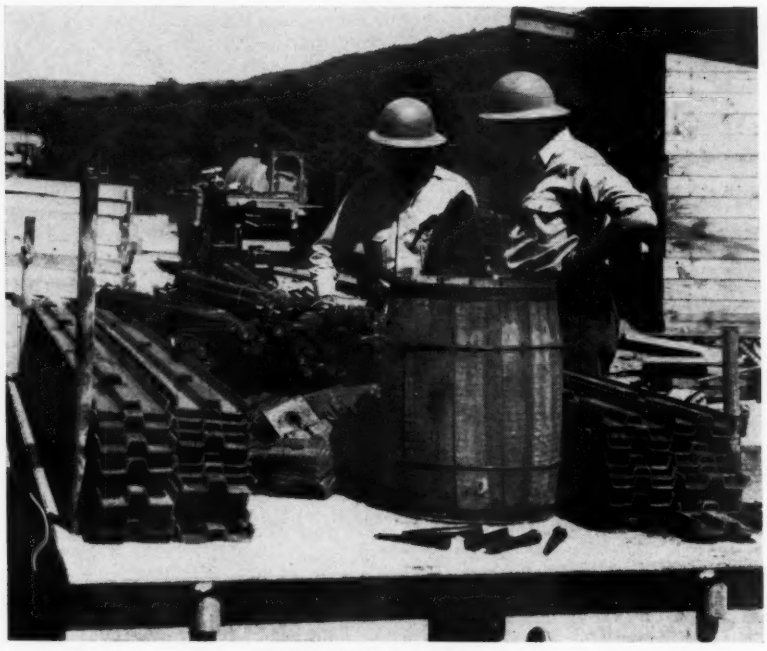
## Advantages of Roof Bolting

That roof bolting has contributed materially to safety in tunnelling is readily apparent when it is considered that normally many places now supported would have remained unsupported because of the desire to save on timbering costs in questionable areas. Furthermore, the fact that roof bolting can be used directly to the face is of enormous value, since it is at the face most of the roof fall accidents occur.

It is proposed to consider now a few of the less readily obvious ad-



**Materials cost for conventional support $38.25 per linear foot: for roof bolts $4.77**



**Supply handling is simplified**

vantages offered by roof bolting, factors perhaps not easily subject to dollar and cents determination, but nevertheless having important economic advantage.

Generally, in the case of concrete-lined tunnels, the roof supporting members, particularly if they are timber, must be kept clear of the minimum concrete line and in many cases clear of the mean effective thickness. Obviously, it is quite possible to reduce the amount of excavation by as much as 10 to 15 percent and the amount of concrete to well over 30 percent by the judicious use of roof bolts. In a large project this saving can assume major proportions.

A factor frequently overlooked by contractors in the desire for speed is the fact that loose rock which collects on conventional timbering must be cleaned off and timber and rock removed prior to concreting operations. Frequently this apparently inconsequential item can be an exceedingly expensive operation, and it occurs near the end of the job when the average contractor can ill afford it. Furthermore, in this same connection, alignment of support can be a serious matter. Frequently poor alignment due to haste or careless work, or possibly knocking out of posts or pins can result in a very expensive project to realign the support to be clear of the concrete.

A less obvious beneficial effect of roof bolting is the influence on the ventilation in the tunnel. By improving the friction characteristics of the tunnel walls, the effective area may be increased by as much as 45 percent. A recent study conducted in West Virginia as reported by Wm. D. Meakin in the January 1951 MINING CONGRESS JOURNAL indicates clearly the effect of timbering in a mine. Ignoring the very substantial saving in actual costs of construction between a roof bolted and conventionally supported equivalent drift, a saving running into hundreds of thousands of dollars, the study shows the following: In equivalent sized drifts of 10,000 ft. length and approximate cross-section of 14 by 7 ft, the roof bolted drift showed a power saving of $20,300 per year over the conventional timbered section for ventilation.

Another factor not readily subject to dollar value analysis is the matter of good housekeeping. Elimination of posts and ribs, frequently out of line, permits the cleaning up of muck in the heading as well as fly rock to a degree almost impossible when conventional timbering is used. Thus ditches and track work can be more readily maintained and the dangers of derailment are reduced. Inherently, a well kept up job is a more efficient one, and is not only a safer job but will generally show a lower cost.

## Compare Direct Costs

The aforementioned items are almost all factors not subject to dollar-wise evaluation, so let us examine the labor and material cost comparison.

Consider an 11-ft finished tunnel, having a driven diameter of about 13 ft as a basis of comparison. Conventional steel sets will have a weight approximating 450 lb per linear ft. Such steel would probably cost about 8½ cents per lb or a total cost of:

450 lb at $0.085=$38.25 per lin ft.

For an equivalent roof bolted area the following would be necessary:

2 Bolts at $1.19=$2.38
2 Wedges at $0.145=$0.29
2 Angle Washers at $0.23=$0.46
½ Roof tie 9 ft long at $3.28=$1.64
Total—$4.77/lin ft.

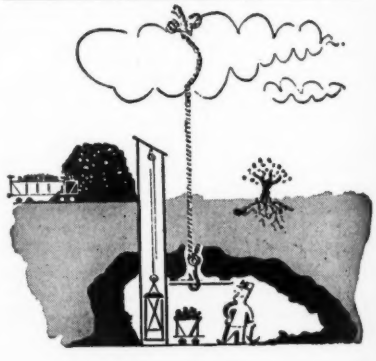
The ratio for material is thus about 1 to 8.

A comparison of equivalent labor costs is much more difficult since it depends on the amount of tunnel being supported, whether support is erected continuously or not and whether steel is carried directly to the face or not.

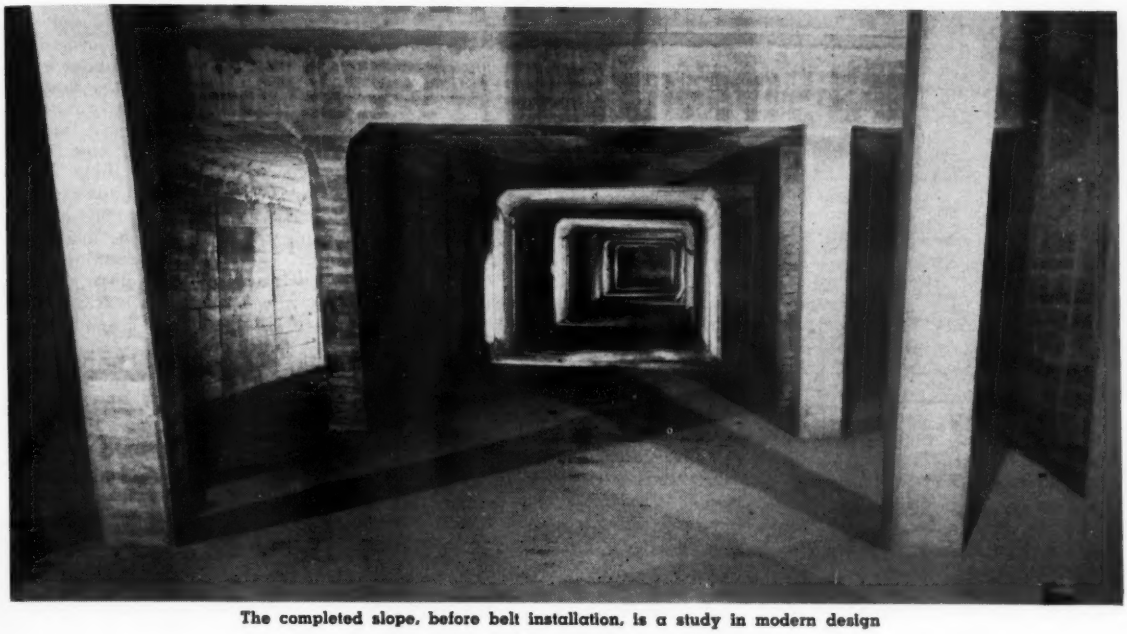
Any available figure could be readily disputed. Therefore an actual case is given and left to the reader's judgment for the final verdict. In an actual case in a tunnel in which conventional steel was being erected continuously a steel crew of six men was employed each shift to erect support. In an approximately similar tunnel where roof bolts were being continuously erected, from the drill jumbo, a crew of four men each shift maintained the pace. We can, therefore, conservatively state that the conventional steel cost 50 percent more per linear ft of tunnel to erect. As a matter of fact, actual cost figures even exceed this differential, but they are not based on sufficiently controlled conditions to warrant quoting.

It has been attempted so far to outline in a general way the advantages to be gained by using roof bolts, but it is imperative again to state in most emphatic terms, that roof bolting is definitely not the ultimate in roof control.

Not only is it not always appropriate, but it is a method which calls for even more supervision and control than ordinary roof supports. Tunnel supervisors are rather prone to let foremen and miners more or less shift for themselves. The latter are almost invariably reckless and willing to take chances. Nothing could be more dangerous in a roof bolted tunnel, for not only is an improperly placed roof bolt a hazard but the false sense of security it evokes makes it doubly so.



# Slope Sinking at Peabody No. 10



The completed slope, before belt installation, is a study in modern design

## Careful Planning and Timing Pay Off at Illinois Coal Mine, As Slope Is Driven From Three Points At One Time

By LYLE MORRIS
Division Engineer
Peabody Coal Co.

PLANNED methods and timing materially accelerated the completion of the initial development period for the shaft and slope sinking at the new Mine 10 of Peabody Coal Co., near Pawnee, in the western part of Christian County, Ill., As a result, the mine will be in full scale operation before the originally scheduled date.

At the above location the Illinois No. 6 coal seam approximately 7 ft 6 in. thick, under 350 ft of cover, consisting of: 64 ft of soil, sand, gravel and clay at the top; then about 8 ft of limestone, with shale and rock down to the Herrin limestone immediately above the coal.

### Set Goals

Specifications by the management for the mine and facilities included the following:

Capacity—13,200 tons per day from two-shift operation at the rate of 1000 tph.

Slope—16° incline with a 6-ft wide belt compartment and an 11-ft wide manway and track space, both 8 ft high in the clear, 1242 ft long to the coal level and an additional 260 ft to the bottom of the lower hopper; a total length of 1502 ft.

Air Shaft—Vertical 15-ft diam circular, concrete lined shaft 350 ft deep.

Surge Hopper—1000 tons capacity at the foot of the slope.

Coal Haulage—All belt, consisting of 36-in. room panel belts, 42-in. sub-main belts, 48-in. mother belt, 60-in. shuttle belt over the hopper, and a 48-in. steel cable reinforced belt up the slope.

Bids were obtained and a contract was awarded to the Dravo Corp. to sink the air shaft and to construct the concrete portion of the slope from the surface through the unconsolidated material and upper limestone to a vertical depth of 80 ft, or a slope distance of 314 ft. From past experience, it was decided that the coal company forces could drive the rock portion of the slope most economically.

The contractors estimated time for sinking the air shaft was four months, while the time required for the concrete portion of the slope was 9½ months. This schedule would delay production 5½ months if the slope were driven only from the top down. Consequently, it was planned to drive in coal from the bottom of the air shaft to the slope and work the slope both up and down from that point until driving in the rock could be started at the top. Thus, the slope was worked from three points simultaneously.

### Sinking the Air Shaft

The work was planned and performed so sinking the air shaft was started in January 1951 and it was taken over by Peabody in June. After the shaft was completed, temporary skips and hoist were installed. Development was started with three six-man crews driving toward a 26-in. drill hole which had been sunk previous by a contract oil drill rig. This hole was approximately 300 ft west of the air shaft. It was cased and grouted so that it would be dry. On the surface blowing fan was installed temporarily and a stacker cage rigged

up; this provided the second escapeway prescribed by Illinois State Mining Laws when more than 20 men are working in coal mine development. After the development period, when this hole is no longer needed for ventilating purposes, an exhaust fan will be installed over it to remove dust from the dump hopper.

The coal produced during this period was hoisted in two counterbalanced 2½-ton drop bottom skips with rope guides which dumped the coal directly into railroad cars on the surface. In this manner 1500 tons per day could be mined. It was possible, thus, to mine out an area adjacent to the slope bottom sufficiently big to gob all of the slope and bottom hopper rock. This eliminated the expense of rock hoisting, which would have been a large item, and also permitted marketing the development coal.

Rope guides were used in the shaft so that they could be easily removed when lowering large equipment, like loading machines and shuttle cars.

Entries driven from the air shaft reached the point where the coal and slope intersected on August 25, 1951. A two-drum 75 hp electric hoist was installed at this point to raise and lower material and equipment up and down the 16° slope.

## Slope Driving Up Grade

Driving the slope upward was then started. The rock face was drilled with three hand-held Sullivan air hammers and shot with 60 percent dynamite, using eight different types of delay caps.

Broken material in the first 40 ft of the slope from the coal intersection up was loaded by an 11 BU machine into a 10 SC shuttle car. Here it was found that this equipment could no longer be used, so a Joy three-drum slusher mounted on a loading machine head was placed in the slope. The slusher bucket dragged the rock into the loading head which served as a surge bin for the shuttle car. By this time 30-lb rail had been laid behind the slusher so that a car could be run up and down the track, pulled by the 75 hp hoist. The car was made from a battery driven shuttle car with the rubber tires replaced with 12-in. track wheels. The slusher was anchored each time it was moved toward the face to four 2½-in. pins sunk 3 ft into the bottom.

## Roof Support

It was found that legs could not be used to support the 120-lb railroad rail cross bars which were set on 24-in. centers for timbering the slope, because they interfered with the slusher. Consequently steel pins were placed in two 2½ in. holes drilled three ft into the rib. Across the top of the pins were placed four by four-in. pieces of oak board on which were set the 120-lb rails. When the face advanced 100 ft, the slusher was moved up and temporary center props placed under the steel rail cross bars behind it.

Permanent timbering, consists of 10 in. H-beam stringers on each rib and another line of 10 in. H-beam stringers six ft from the north rib of the slope. This separates the belt and track compartments of the slope and adds to the center support of the cross timbering. Under these stringer beams are legs made up of two 120 lb steel rails placed back to back; these are set on eight-ft centers and welded to the stringers. To keep the legs from cutting into the bottom, a half-in. steel plate, one foot square, is used as a mud sill. Two 2½ in. holes are drilled through this plate and into the bottom three ft deep for steel anchor pins to keep the mud sills from moving down the slope. Then all of the stringer beams, steel legs, mud sills and pins are welded together.

After the slope had advanced 75 ft, it was decided that hauling the muck to the bottom was too slow a process, so starting from the coal level a glory hole was driven up to the bottom of the slope. This glory hole was six ft in diam and 18 ft deep. Track was then placed across the top so that the shuttle car could dump into it as a storage bin. Mucking operations could then move along more continuously. At the bottom of the glory hole, a counter-weighted gate was installed. A shuttle car could open the gate, receive its load of muck, which was then taken into gob rooms and dumped.

On the first and second shift there were two eight-man crews and on the third there was a four-man crew for maintenance work.

After the beam timbering was completed, the first two-in. flash coat of gunite was applied. Tie-wires were placed in the flash coat and the gunite allowed to harden. Then a reinforcing wire of four by six-in. mesh, six ft high, was placed along the sides of the slope and covered with a three in. coat of permanent gunite. This was done to keep the shale ribs from air-slacking. The gunite machine was a jet-crete type. Its nozzle could be operated some 400 ft from the machine. It took three men to perform this operation, one man at the machine preparing the mix and feeding the machine, one man at the nozzle, and one man cleaning up.

By this method, the slope was driven up the grade at an average of 7.34 ft per day.

## Top Caissons Sunk

In the meantime, Dravo Corp. proceeded with their proposed method of constructing the upper concrete portion of the slope. Through the soft surface strata, they sank three reinforced concrete caissons so arranged that the slope would be concreted into the base of these structures.

**The use of caissons permitted the erection of permanent buildings while the slope was still being driven**

Merits of this method of construction are: (1) the surface ground was disturbed very little beyond the width of the slope. Nearby buildings were constructed on simple spread footings and were built while caisson sinking was still in progress. (2) The exact break-under location did not need to be determined until satisfactory rock was located within the test pit. (3) Strata of wet, running sand encountered during the sinking were cut off as the caissons dropped and caused no further trouble. (4) The large caisson, firmly seated upon rock, protects the transition section of the slope from earth pressures which might otherwise be excessive.

The first caisson, 107 ft long and 28 ft wide, was sunk at the brow-under point until its cutting edges bore uniformly on rock. Inspection of the underlying rock from a test pit excavated beneath the caisson disclosed a satisfactory location for making the transition from open cut to tunnel construction. Working from the end wall of the caisson downward to this point in short sections, excavation was made and the concrete floors, walls, and roof of the slope poured. Using steel beams to support the rock overhead, several feet of tunnel were driven and lined with concrete.

With location of the slope thus established, work on the other two caissons, closer to the portal, each 38 ft long and 26 ft wide, was started. These caissons were formed so the slope passed through them near their bottoms and each was sunk to a predetermined elevation. To prevent any future settlement, a concrete seal

**When driving up the slope the three-drum slusher had to be anchored in place by pinning it to the bottom**

CONSTRUCTION SUMMARY

| | Length in ft | Days | Average ft per day |
|---|---|---|---|
| Air shaft | 350 | 106 | |
| 26-in. drill hole | 420 | 10 | |
| Driving in coal | 529 | 44 | |
| Caisson work | 314 | 224 | |
| Driving slope up | 778 | 106 | 7.34 |
| Driving slope down | 151 | 21 | 7.19 |

three ft thick was placed under each of these caissons.

The three caissons were separated by four-ft spaces and, after all sinking was completed, steel sheet piles of arch-web sections were driven between the corners of adjacent caissons thus closing off the ends of the four-ft wide openings. The small cofferdams thus formed were excavated to a depth of three ft below the slope floor, the sheet piles being braced as excavation progressed. Short beams spanning recesses were left in the caissons. Holes slightly larger than the slope were blasted through the end walls of the caissons and the concrete construction of the slope within the first caisson was extended through both smaller caissons and closure cofferdams. From the last caisson to the surface, a short section was built within steel sheets and the remainder in open cut. Incorporated in the portal section was a man-trip loading platform and foundations for the main hoist and motor-generator set.

The design and method of building the concrete caissons were generally similar for all three. Each was rectangular in plan with the outside surfaces made as smooth and true as practicable. Steel cutting edges were provided at the bottom of, and flush with, the outside surfaces. The lower six ft of the outside walls were wedge-shaped, the inside faces sloping upward and inward from the cutting edge. As a result of this shape, earth, sheared off by the cutting edge as the caisson sank under its own weight, was rolled towards the center of the six-ft high "work chamber." Vertical holes—approximately 10 ft in diameter and spaced evenly—were left in the caissons. Through these holes (16 in the large and six in each of the smaller caissons) material was excavated from beneath the caissons by means of 1½ cu yd clamshell buckets handled by full-revolving cranes. Forms were designed and fabricated to be usable in all caissons with only minor alterations.

## Slope Driving From Top

The upper concrete portion of the slope (314 ft long) was completed by the contractor on December 7, 1951, and Peabody crews started driving

*(Continued on page 96)*

**On January 12, 1952 the slope holed through, 778 ft from the coal and 465 ft from the portal**

**Careful, accurate surveying meant that the slope driven from top and bottom met exactly**

From the C. M. & S. Co. plant at Trail, B. C., the process has spread all over the world

# The Cominco Suspension Roasting Process

## Operating Refinements and Changes in Design Reviewed and Evaluated in Light of Latest Requirements

By K. D. McBEAN
Metallurgical Engineer
The Consolidated Mining & Smelting Co. of Canada, Ltd.

EXPERIMENTS in suspension roasting were first started at Trail, B. C. before 1928, following the decision of the directors of the Consolidated Mining and Smelting Co. of Canada, Ltd. to develop plants for the efficient recovery and utilization of the waste sulphur dioxide gases. The program called for the treatment of the zinc roaster gases in a contact acid plant, which required higher sulphur dioxide concentrations than could be obtained from the existing multiple hearth roasters.

Almost immediately following the conversion of a Wedge multiple hearth furnace to a combustion chamber type, the process was successful. It evolved rapidly, mainly in the direction of greater unit capacity, along with improved sulphur elimination consistent with gases rich in $SO_2$. The system of drying the concentrates by recirculation of the hot combustion gases was developed, and the recovery of heat from the effluent gases by the installation of boilers was worked out.

### Process Used Widely

In 1932, the Grasselli Chemical Co. became interested, and the following year began construction of a plant at Newcastle, Pa., which began operating in July, 1934. Soon afterwards plants were installed all over the world. Some of the world wide exploitation of this process may be realized from the fact that about 3000 tons of concentrates are being treated daily, and a grand total exceeding 10,000,000 tons of concentrates have been treated up to the present time.

### Improve Performance

Several changes have been made in the original system. It has been found that sulphate sulphur can be reduced to 0.4 percent by the return of the dust products to the hearth at the base of the combustion chamber. The cast iron rotary calcine conveyors have been superseded by screw conveyors with water cooled castings and shafts, which are more satisfactory at the higher calcine temperatures resulting from roasting in suspension. In order to conserve water and to recover an appreciable quantity of heat, the warm water from the calcine conveyors has been added to the feed water for the waste heat boilers.

Firetube boilers were discarded in favor of the water tube type, with two drums and vertical tubes, on all of the eight Trail suspension roasters. Corrosion troubles were satisfactorily overcome by a more extensive cleaning schedule and by protecting the first row tubes by shields. The life of the tubes in the first two rows now exceeds three years, with virtually

no replacement of tubes in the other sections of the boiler.

Another method of protecting the front row tubes, consisting of coating the vulnerable portion of each tube with A.I.S.I. Number 317 stainless steel, has been under test. These tubes have shown no measurable corrosion after three years and, although this method would be costly, it might prove to be the most economical in the long run.

Experience on other installations has indicated that boilers operated at steam pressures above a minimum of 350 psi would be corrosion free, and one plant operating at 450 psi has had no tube failures after about four years' operation.

## Oxygen Enrichment

The greatest single benefit derived from oxygen enrichment of the combustion air has been the increase in capacity for the same size of installation. Many of the other advantages, namely, increased $SO_2$ concentration in the exhaust gases, greater unit drying capacity and greater steam recovery, have followed as a corollary of the increased capacity. Other advantages have included increased flexibility in the operation and the ability to roast coarser concentrates satisfactorily.

The theoretical gas strength obtainable with the unlimited use of 90 percent oxygen would be about 85 percent $SO_2$. However, in a commercial sized unit, it would be necessary to recirculate about 80 percent of the boiler outlet gases for cooling the combustion chamber, and, due to air infiltration, the gas obtainable would be between 50 and 60 percent $SO_2$ maximum.

Cooling by injecting water into the combustion chamber would seem to offer an alternative method to reduce air infiltration, but on large scale units this would have certain defects. The loss in steam recovery would be appreciable, the dew point of the gases might be lowered to the danger point and the increased volumes, due to the vapor, would require larger gas handling equipment for the same tonnage roasted.

## Modern Plant Described

Figure 1 shows, in diagrammatic form, a typical arrangement of a plant recently built in the eastern United States. The furnace proper, 1, includes the combustion chamber, 2; the calcine collecting hearths, 3 and 4; and the drying hearths, 5 and 6. Each hearth has four rabble arms attached to and rotating with the truncated shaft, 7, which is driven by a two-speed reduction gear and motor.

Combustion air is supplied by the fan, 8, which is also used for recirculating the hot chamber gases through the conduit, 9, across the drying hearth and into the two diametrically opposed burners, 10. The wet concentrate hopper, 11, is discharged by the belt feeder, 12, into the screw conveyor, 13. The furnace discharges dried concentrates through the surge bin, 14, into the air swept ball mill, 15. The fine dry concentrates are blown by the fan, 16, through the classifier, 17, to the cyclone collector, 18, which discharges through an air lock, 19, into the hopper, 20. Concentrates are fed to the furnace by the feeder, 21, via the high pressure air injectors, 22, the mixer, 23, and the two conduits, 24. The chute, 25, with an air seal device, 26, conveys the calcine from the hearth, 4, to the water cooled screw conveyor, 27, which discharges to other means of conveying.

The main gas outlet, 28, leads directly into the waste heat boiler, 29. The boiler has been preferably of the vertical water tube three-drum type, with horizontal flow of the gases, but vertical two-drum boilers, with baffles, have also been satisfactory. Under circumstances, vertical tube forced circulation boilers of the Lamont type, would be advantageous. This type of boiler can be sealed very efficiently against air infiltration, since it is possible to clean it by mechanical rapping. The screw conveyor, 30, would be arranged to discharge the precipitated boiler dusts either to the finished product conveyor, 27, or to the bucket elevator, 31, for return to the furnace by the feed screw, 32. From the boiler the gases are drawn through the two parallel cyclone dust collectors, 33, by the two fans, 34, and passed into the header balloon flue, 35, and thence to an electrostatic precipitator when treating zinc concentrates, or to a wet scrubber when burning pyrrhotite or pyrite concentrates.

At this stage, the gases have been cleaned and are suitable for processing in an acid or sulphate paper plant, or for delivery to an absorption plant, as a step in the production of liquid $SO_2$ or elemental sulphur.

The plant, as outlined for the roasting of zinc concentrates, would be modified somewhat for the treatment of pyrite and other iron sulphide concentrates. Pyrite and pyrrhotite desulphurize at coarser sizes and at a faster rate than zinc concentrates. They generally have less moisture, and the ratio of roasted product to the

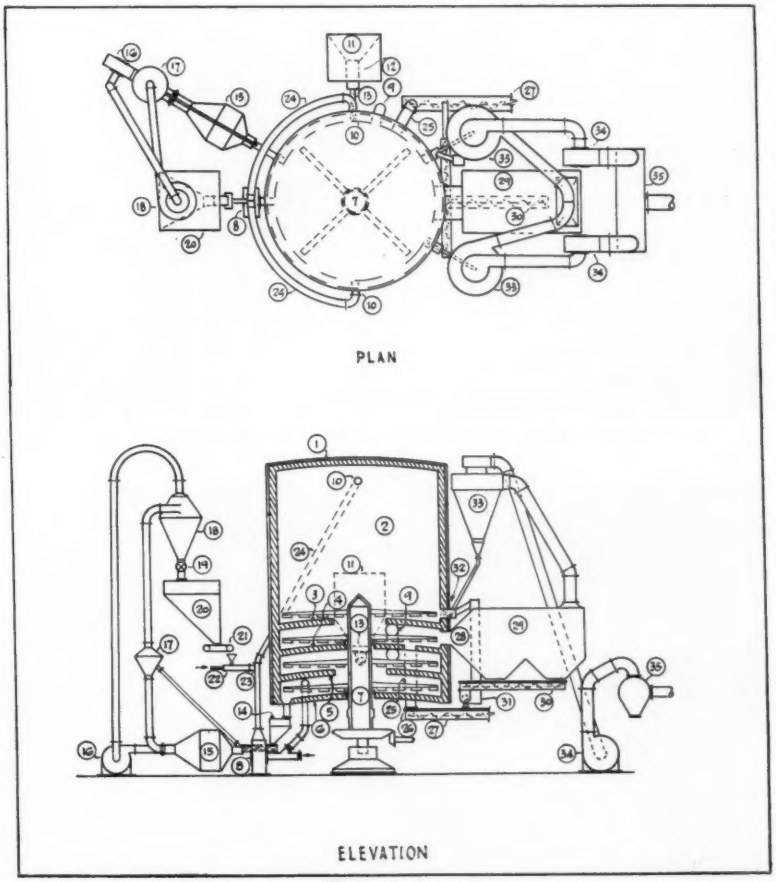



**Figure 1**

original concentrates is less. The products are also more granular, have a higher fusion point and the dusts are less adhesive. These properties permit a much higher capacity rate per square foot of furnace area and per cubic foot of chamber space, and generally one drying hearth and one calcine hearth would be sufficient. Also, a simple ball mill, or hammer mill, without air classification, would be satisfactory in most cases.

## Pre-Dry Concentrates

In the latest design of plant, wet concentrates are fed to the drying hearths below the combustion chamber by means of a screw conveyor, having flights of small pitch diameter. In rabbling across the drying hearths, the concentrates are completely dried by the hot gases which are continuously circulating between the combustion chamber and both drying hearths. A feature of this drying system has been the extreme flexibility of the operation and the complete freedom from any dust handling problem. If the concentrates should be very wet, more gas would be circulated, and if the concentrates should be over-dried, even up to ignition of the particles, the dust formed and gases evolved, would be carried to the burner and would enter the combustion chamber along with the regular feed.

The size and type of grinding installation depends upon the original sizing of the concentrates. In order to obtain efficient roasting, it should have sufficient capacity to give a product with a minimum passing a 200 mesh screen of 96 percent when treating zinc concentrate, and of 80 percent when treating concentrates of pyrite or pyrrhotite. Air swept ball mills, with classifiers, have been very satisfactory where installed. In other plants, simple ball mills, or swing hammer mills, have given the necessary fineness.

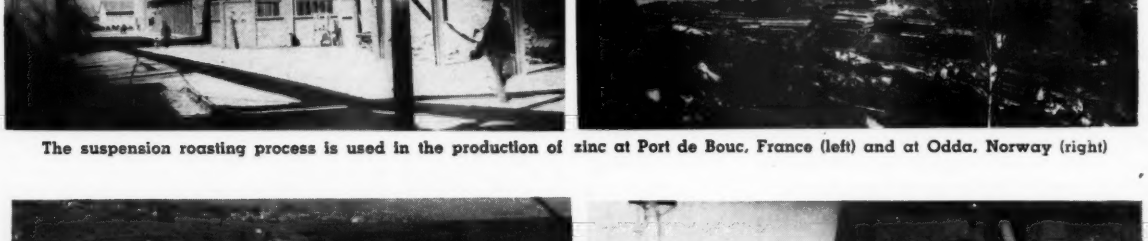
## Feed Well Mixed

Attempts have been made to blow concentrates directly from the ball mill into the burner without first collecting them in a hopper. However, on zinc concentrates, this was a failure due to the lack of exact and ready control over the ratio of air to concentrates. Such a system would be reasonably satisfactory for pyrites and other iron sulphide concentrates, but the feed hopper system would give better results.

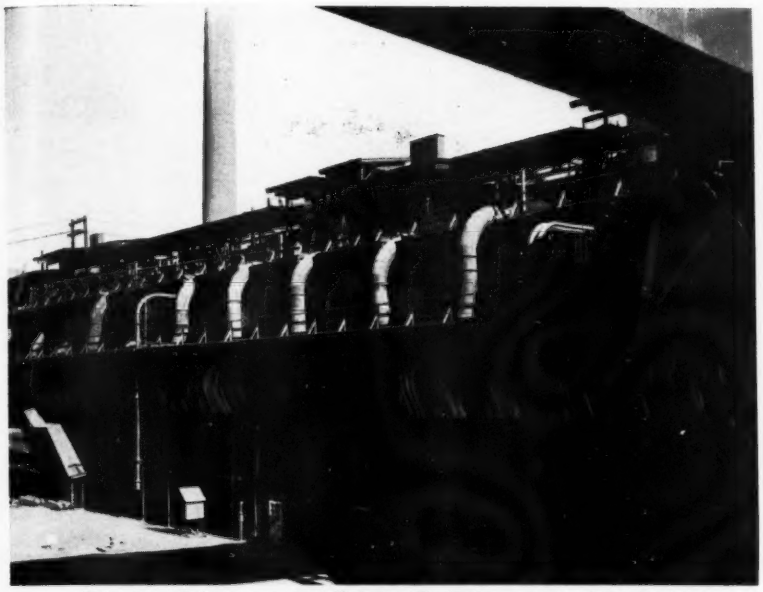
Normally, the fine dried concentrates are fed from the hopper by a belt feeder with volumetric control, and are carried to the mixer by air at a pressure of about 30 psi. In the mixer, the concentrates are met by the secondary air plus the drying gases, and by means of vanes and the tangenial entry of the concentrates, complete mixing takes place. The mixture is then divided into two streams and enters the combustion chamber through two diametrically opposed burners situated near the top of the furnace.

The temperature in the combustion chamber is usually maintained at about 1850° F (1010° C) although this is not a critical figure and it may vary considerably without harmful results. However, above 1900° F (1038° C) zinc calcine tends to become sticky, and below 1700° F (925° C) there might be some loss in capacity. Once the burning characteristics of a concentrate have been determined, maintenance of the desired temperature is relatively simple and is usually obtained by small adjustments in the rate of feed. This regu-

The suspension roasting process is used in the production of zinc at Port de Bouc, France (left) and at Odda, Norway (right)



There are other installations in Spain (left) and Northern Rhodesia (right)



**This view of the roaster installation at Trail shows some of the detail explained in the text**

lation can be made automatic if very accurate temperature control is especially desirable.

The mixture of concentrates and gases, after passing through the two burners, enters the combustion chamber with considerable turbulence. This turbulence is further increased by the two opposing streams meeting each other in mid-chamber. Accretions do not build up on the walls and better use of the combustion space has been obtained over the use of a singie burner only. Ignition takes place near the burner mouth, and combustion of the sulphur is nearly completed in the suspension phase of the operation. On the average, in the various plants using the process, about 40 percent of this product leaves the furnace in suspension with the gases, and about 60 percent settles out on the collecting hearth. These figures, of course, would vary according to the fineness of the concentrate and the percentage capacity at which the furnace was being operated.

## Return Dust to Furnace

Collecting hearths at the base of the combustion chamber play a very important role, and are a valuable feature of the process. Their most important function is the provision of time and opportunity for the elimination of the sulphide sulphur not oxidized in the suspension phase, and for the decomposition of the sulphates which are formed in the dust products. This return of dusts to the hearths increases the over-all sulphur recovery, and, in the case of most zinc concentrates, improves the over-all zinc solubility of the calcine. The hearths also provide a hot body of calcine in the furnace which has a very stabilizing influence, so that the temperature is not upset by small variations in the operating conditions.

Material settling on the hearth would normally contain about one percent sulphide sulphur and practically no sulphate sulphur. The dust products that are collected in the boiler and cyclone have a somewhat lower sulphide sulphur content, but sulphate sulphur may be as high as 3.5 percent. In the majority of plants, the dust products are continuously returned to the hearth at the base of the combustion chamber. As the material is rabbled across the hearths, the residual sulphide sulphur in the products is further oxidized and the sulphate sulphur is decomposed, so that the final product, as discharged from the furnace, contains on the average about 0.3 percent sulphide and 0.4 percent sulphate sulphur.

The dust products are returned to the hearths, not only to decrease the total sulphur content, but also to improve the settling and filtering qualities of the leached calcine. The settling and filtering rates of the over-all mixed product are comparable to multiple hearth calcine.

## Gases Cooled First

Gaseous products, at nine percent $SO_2$ or higher when treating zinc concentrates (especially higher on iron sulphides) and at approximately 1700° F (925° C) pass directly into the waste heat boiler where about 15 percent of their dust load is settled and the gases are cooled to about 550° (288° C).

Upon leaving the boiler, the gases pass into one or two cyclones, depending upon the size of the suspension roaster, where from 85 to 90 percent of the contained dust is removed. This dust, amounting to from 30 to 40 percent of the weight of the feed to the furnace, contains about 1.0 percent sulfide sulphur and 3.5 percent sulphate sulphur. It is discharged from the cyclone through a rotary valve, or air seal, and is continuously returned to the furnace just above the combustion chamber hearth along with the boiler dust.

Cyclones and fans develop troublesome accretions when the furnace gas temperatures exceed 1000° F (538° C). Therefore, common practice is always to install the boilers or heat exchangers ahead of the cyclones.

## Catch Remaining Dust

The gases upon leaving the cyclone fans have a temperature of about 500° F (255° C) and carry a dust burden of about three grains per cu ft at the operating temperature, equivalent to four percent of the weight of the original feed. When treating zinc concentrates, the gases are cleaned in an electrostatic precipitator, and the precipitated dust, which normally assays 0.1 percent sulphide sulphur and about 7.5 percent sulphate sulphur, is returned to the combustion chamber hearth for sulphate sulphur decomposition.

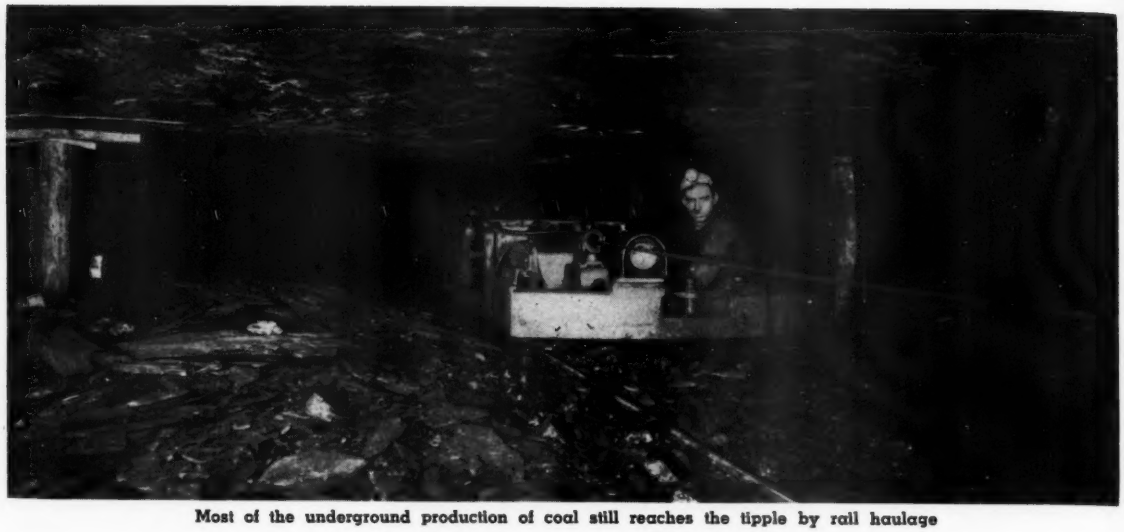
Gases from the roasting of zinc concentrates usually have a good conductivity factor and humidification is not necessary. The optimum velocity through the treater is about 120 fpm, at which speed a dust precipitating efficiency of about 98 percent is normally obtained.

Combining cyclones and treater has given a highly efficient gas cleaning system, and over-all dust catching efficiencies of 99.8 percent are obtained in modern suspension roasting plants. The final gases leaving the treater normally carry about 0.1 grain of dust per cu ft at standard conditions. From zinc concentrate roasters the treater outlet gases contain from eight percent $SO_2$ upward, depending on the type of concentrate being roasted and care taken to prevent air dilution.

## Labor Requirements Low

Owing to the complete instrumentation and to the essentially automatic nature of the process, labor requirements are small and no special training or qualifications are required. For a single unit treating 150 tpd of concentrates, one operator plus one helper per eight-hour shift would be sufficient for the operation of the furnace and auxiliary equipment. Maintenance and other labor would, in a

*(Continued on page 84)*



Most of the underground production of coal still reaches the tipple by rail haulage

# Coal Haulage Underground

## Increased Production is Reflected by Changes in Methods of Moving Coal From Face to Tipple

By W. H. YOUNG and R. L. ANDERSON

Chief, Bituminous Coal Section
U. S. Bureau of Mines

Engineer-economist
U. S. Bureau of Mines

ANIMALS—most frequently mules—were the chief motive power for transporting coal underground before 1880. Horses, ponies, and oxen were also used. From 1880 to 1900 production expanded rapidly, the size of mines increased, and distances underground became greater, creating a need for better transportation.

Rope-haulage units were first installed about 1870, replacing mules on main-line haulage in a number of mines. A few steam locomotives were employed underground at about the same time rope-haulage was introduced. Compressed-air locomotives were introduced in 1875. Electric mine locomotives were first employed in 1887, but their use was rather limited until about 1900. After 1905, the number of electric locomotives increased rapidly. A gasoline locomotive was first used in the underground mine in 1898, but few installations were made because of the dangers involved in their operation. Though diesel mine locomotives have been used for many years in coal mines in Europe, very few have been employed in United States coal mines.

The following summaries were compiled from annual reports to the Bureau of Mines by bituminous-coal and lignite operators and include all mines annually producing 1000 tons and over. Table 1 gives figures by types of haulage, and tables 2 and 3 give detailed data for "mother" conveyors.

### Animals

The use of animals for underground haulage in coal mines has declined sharply in the last 25 years. In 1950 there were only 10,000 animals in bituminous-coal and lignite mines compared with over 36,000 in 1924. Mules were used almost exclusively in small mines in 1950. About 2100 mines employed animals only in 1950; these mines produced 13,000,000 net

Table 1.—Underground bituminous-coal and lignite mines and haulage units in use in the United States, in selected years[1]

| Units | 1924 | 1946 | 1948 | 1949 | 1950 |
|---|---|---|---|---|---|
| Underground mines | 7352 | 5888 | 7108 | 6798 | 7559 |
| Locomotives: | | | | | |
| Trolley | [2]12,765 | 14,110 | 14,617 | [3]14,090 | 13,822 |
| Battery | 1515 | 1011 | 904 | [3]928 | 949 |
| Other types | 443 | 110 | 74 | [3]59 | 62 |
| Total | 14,723 | 15,231 | 15,595 | [3]15,077 | 14,833 |
| Rope haulage units: | | | | | |
| Portable | (4) | 4084 | 3886 | 3904 | 4225 |
| Stationary | (4) | 1009 | 1044 | 1073 | 1037 |
| Total | 649 | 5093 | 4930 | 4977 | 5262 |
| Shuttle cars: | | | | | |
| Cable reel | (4) | (4) | (4) | 2144 | 2782 |
| Battery | (4) | (4) | (4) | 623 | 512 |
| Total | (4) | (4) | (4) | 2767 | 3294 |
| Mother conveyors | (4) | 457 | 755 | 860 | 1013 |
| Animals | 36,352 | 10,185 | 10,834 | 10,313 | 10,033 |

[1] Exclusive of lignite and Virginia semianthracite mines in 1946, 1948, and 1949.
[2] Includes combination trolley and battery locomotives.
[3] Revised.
[4] Data not available.

tons or only three percent of the total underground output and their average annual output was only 6000 net tons per mine.

## Locomotives

The electric locomotive had established itself as the predominant type of underground haulage in 1924 and has retained its position. There were 12,765 trolley locomotives in 1924 and 13,822 in 1950. The number of battery locomotives declined from 1515 in 1924 to 949 in 1950. The big change in the past quarter century has been in the "other types" of locomotives, declining from 413 in 1924 to only 62 in 1950. In 1924 there were 85 compressed-air locomotives, 226 gasoline and 132 steam locomotives, a total of 443 locomotives other than electric in use in underground bituminous-coal mines. Many reported as "other type" in 1924 and in later years probably did not operate underground but were used for outside haulage. Although there were 779 "combination trolley - and - battery" locomotives in 1924, there was no record of any of these in use in 1950.

## Rope-Haulage Units

Rope-haulage units were not very important in 1924 but achieved very substantial growth in later years. The record indicates that approximately 5000 have been in use since 1946. The haulage units reported here include both portable and stationary hoists but exclude scraper hoists, shaft and main-slope hoists, and hoists used for car shifting at conveyor heads or slope conveyors.

## "Mother" Conveyors

Belt-conveyor haulage is growing rapidly. The total length of "mother" conveyors in underground bituminous-coal and lignite mines increased from 98 miles in 1945 to 295 in 1950, or 200 percent. Figs. 1 and 2 show graphically the growth of "mother" conveyors from 1945 to 1950. Table 3 shows 1950 data on "mother" conveyors, by States. West Virginia, Kentucky, and Pennsylvania are the largest users of "mother" conveyors. Production at mines using "mother" conveyors increased from nine percent of the total underground output in 1945 to 24 percent in 1950.

Table 2.—Underground bituminous-coal mines using "Mother" conveyors in the United States, units in use, and length of units, 1945-50[1]

| Year | Number of mines | Number of units | Average length (feet) | Total length (miles) |
|---|---|---|---|---|
| 1945 | 117 | 359 | 1438 | 98 |
| 1946 | 161 | 457 | 1484 | 129 |
| 1947 | 199 | 594 | 1470 | 165 |
| 1948 | 270 | 755 | 1460 | 209 |
| 1949 | 314 | 860 | 1514 | 247 |
| 1950 | 374 | 1013 | 1538 | 295 |

[1] Includes all mines using belt conveyors, other than main slope conveyors, 500 ft and over in length, for underground transportation of coal. Excludes lignite and semianthracite mines, 1945 to 1949, inclusive.

Table 3.—"Mother" conveyors used at underground bituminous-coal and lignite mines in the United States, by States, in 1950[1]

| State | Mines using "mother" conveyors | | "Mother" conveyors in use | |
|---|---|---|---|---|
| | Number | Production (net tons) | Number of units | Total length (miles) |
| Alabama | 9 | 1,485,257 | 23 | 6 |
| Arkansas | 3 | 156,925 | 11 | 2 |
| Colorado | 3 | 132,827 | 8 | 1 |
| Illinois | 16 | 5,323,088 | 39 | 10 |
| Indiana | 6 | 2,292,315 | 11 | 2 |
| Kentucky | 68 | 16,081,858 | 195 | 55 |
| Maryland | 2 | 66,444 | 5 | 2 |
| Ohio | 13 | 3,919,901 | 32 | 11 |
| Oklahoma | 4 | 724,174 | 11 | 3 |
| Pennsylvania | 57 | 17,400,543 | 174 | 51 |
| Tennessee | 7 | 825,786 | 15 | 4 |
| Utah | 4 | 1,335,004 | 12 | 3 |
| Virginia | 14 | 2,972,715 | 30 | 10 |
| West Virginia | 162 | 36,886,785 | 437 | 132 |
| Wyoming | 6 | 2,810,022 | 10 | 3 |
| Total | 374 | 92,413,644 | 1013 | 295 |

[1] Includes all mines using belt conveyors, other than main-slope conveyors, 500 feet and over in length, for underground transportation of coal.

## Shuttle Cars

The number of shuttle cars in use in underground bituminous-coal and lignite mines has increased rapidly in recent years. Data thereon was first collected for 1949, and the number in use increased from 2767 in 1949 to 3294 in 1950. Virtually all shuttle cars are used in conjunction with mobile loaders or continuous miners. In 1950 there were 1836 mobile loaders and continuous miners in bituminous-coal mines that loaded into shuttle cars, and 109,408,384 net tons or nearly 50 percent of the total coal loaded by mobile loaders was handled by shuttle cars.

## Detailed Data

Statistics on haulage equipment used in underground bituminous-coal and lignite mines, by States, for the years shown in the preceding summary, were published by the Bureau of Mines in Mineral Market Report 2032, November 20, 1951.

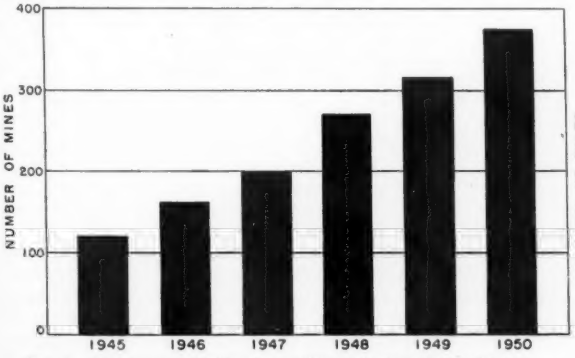



Fig. 1—Underground Bituminous Mines in the United States Using "Mother" Conveyors

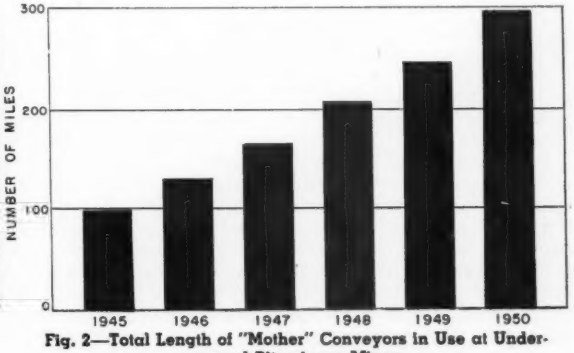



Fig. 2—Total Length of "Mother" Conveyors in Use at Underground Bituminous Mines

Uranium Ore is goal of exploratory drilling on Colorado Plateau

# New Developments in Exploratory Drilling for Uranium Ore

## Application of Improved Equipment and Techniques Will Help Bring Exploration Costs Down

By R. G. SULLIVAN
Vice-President
Minerals Engineering Co.

DRY-HOLE drilling on the Colorado Plateau refers to percussive long-hole drilling using light specially designed hammers. These drills are mounted on trucks or half-tracks and built to use 15 to 20-ft feeds. The compressor is usually mounted on the same vehicle, making the entire unit extremely portable and fast. Drilling procedures involve the use of specially designed tungsten carbide bits, coupled steel, and Gardner-Denver ring seal shanks.

Customary practice with dry-hole drilling is as follows: The hole is collared through the top soil with a 2½-in. bit and two-in. pipe is used to case the hole to solid rock. Hole depths vary from 40 to 120 ft. Samples are caught in large tubs which are placed around the casing pipe. They are taken with each change in formation or at predetermined intervals, whichever fits the particular area that is being drilled.

Usual sample interval is from two to five ft, although much drilling is done where samples are taken in five-ft intervals until the pay-zone is approached, at which time 20 to 40 samples are made in one-ft sections. These samples are immediately tested with a Geiger Counter. If any count is registered the sample is sacked and tested later by more accurate Geiger Methods and chemical analysis. Great quantities of waste samples are thus eliminated immediately and the job of sample preparation and analysis is held to a minimum.

As a check to cutting recovery samples are occasionally weighed. Unless large crevices are encountered, usual recovery exceeds 85 percent with the above described method of collection. Much thought is now being given to improve sampling and recovery meth-

ods. All methods, tried so far, have the disadvantage of not allowing the driller to see changes in formation. This prevents his making accurate sample cutoff points. The use of elaborate devices is not advocated because of the disadvantages of possible salting and long shutdowns for cleaning the collector.

Usual performance of this drill in dry clays, sandstones and conglomerates is 200 ft per eight-hour drill shift. Footages up to and exceeding 500 ft have been recorded, however. Cost of contracts have varied between $0.62 and $1.25 per ft. Limits are placed on this type of drill by the moisture content of formation to be drilled, and its capacity to blow cuttings from a deep hole. Using a two-in. bit, the smallest possible to pass drill couplings in the hole, and 100 psi air pressure, the effective limit has been demonstrated to be about 120 ft. Depths up to 155 ft have been attained where all conditions were extremely favorable.

## Try Higher Pressures

Work is now progressing in blowing air under higher pressure and in the use of drill tubing. If satisfactory drill tubing is available, depths of 200 ft should be easily reached. Flush-jointed couplings, where both the couplings and drill rods approach the diameter of the hole, will increase the velocity of the air and prevent damp material from forming collars at the couplings.

Some departures from the general procedure are being used in isolated instances in the Colorado Plateau. Dry-hole drilling in the Grants District of New Mexico is accomplished with 2½ and 3-in. bits. This is necessary because large samples are required. The use of larger bits slows down the drilling, due to the diminishing of air velocity in removing cuttings. Other users spurn the use of the Gardner-Denver D73 Machine (2¾-in. Piston diam) and substitute larger 3½ and 4-in. machines. Their problems are compounded by the added requirements of larger, heavier compressors and drill tools. Breakage of drill rods, couplings and bits is much greater then when the smaller machines are used.

## Diamond Drilling Increases

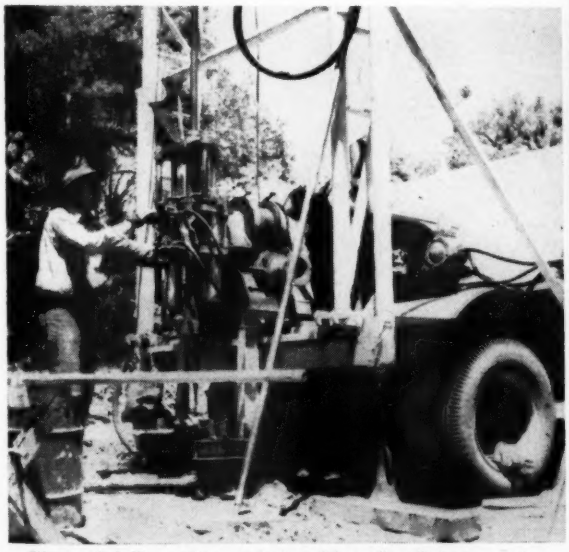
Diamond drilling requirements are undergoing radical changes from the small start three years ago. Prior to 1948 most diamond drilling was contracted by private operators for shallow ground adjacent to mining areas. One company alone drilled 500,000 ft during the previous decade. However, with the advent of the United States Atomic Energy Commission Program, exploratory drilling spread out from the known shallow areas and many 300 and 400 ft holes were drilled. Each succeeding year saw the average depth of holes increase and the overall program increase in size and scope. Today the Government has announced an annual goal of 1,200,000 to 1,600,000 ft per year. Some contracts now in operation by the United States Geological Survey have average hole depths of 750 ft.

With the increase in depth the problems of the diamond drill contractor increased manifold. The earlier small screw-feed surface drills were soon obsolete and in their place were substituted larger hydraulic rigs. Drills which were rated by manufacturers at 1000 ft were found to have

**Dry hole drill is truck mounted and carries own compressor**

effective working depths of only a fraction of their rating. Special types and designs of rigs were assembled to meet the requirements of portability, ruggedness and dependability that were needed to cover the rough terrain and to stay in operation in isolated locations. Excessively large drills proved inefficient in the use of small drill rods and tools.

The problem of bringing water for long distances over tortuous, steep roads, was solved by obtaining larger trucks equipped with tanks having a capacity of approximately 75 percent of the truck-rated capacity. Truck sizes were limited by the crude roads



**Diamond drilling units are designed for self sufficiency, portability and speed of operation**

**Quick Geiger counter examination of drill cores eliminates some samples right away**

over which they traveled. Freezing of water in the tanks was eliminated by installing large heater tubes. In two locations, where contracts called for large footages, long water lines were installed and pumps delivered water to centrally located reservoirs. In most localities pump lines are not feasible as water sources are depleted rapidly and the drilling moves over several square miles.

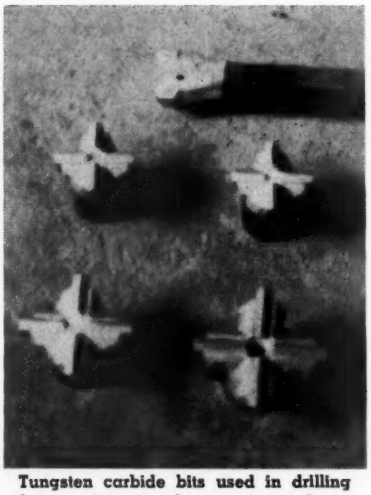
Water storage tanks on the drill units help provide an adequate supply between visits of the trucks. This storage volume has been increased from 250 gal to the present 600 gal.

Circulation loss has always been the first problem in drilling in the uranium fields. Efforts to bring back circulation by conventional means of cementing, casing, etc., are usually of no avail or too costly. In shallow holes the drilling is often continued without water. In holes exceeding 150 ft this procedure is usually not possible as vibration reduces core recovery and the risk of sticking a bit is too great. The usual procedure for holes this deep and those that are deeper is to carry one or two sizes of casing and ream to the point of loss. Reaming may have to be repeated several times before a hole is completed.

The use of an underreamer is now being tried at two locations. If successful this would reduce the need of pulling casing.

## Plug Bit Problem Serious

Concerning the deeper drilling, it has been the practice of the Government for the past year or so to denote



**Tungsten carbide bits used in drilling for uranium ore have extreme insert exposure**

plugbit depths. This practice was initiated to reduce overall cost of drilling by attempting to eliminate reaming in the upper hole section.

Contractors tried to speed up drilling in the plug bit section first by using the conventional tri-cone rock bits. This has been partially discarded as bit costs soared two to four times over that of diamonds and the drilling of a large size "blind" hole consumed more water per foot of hole than the smaller diamond sizes.

Dry drilling with air powered rock bits as the cutting medium has been used with intermittent success. Bit costs were reportedly lower, but wet sections held up progress and raised costs. One contractor used this type of drilling successfully at Long Park but since has reverted to wet drilling.

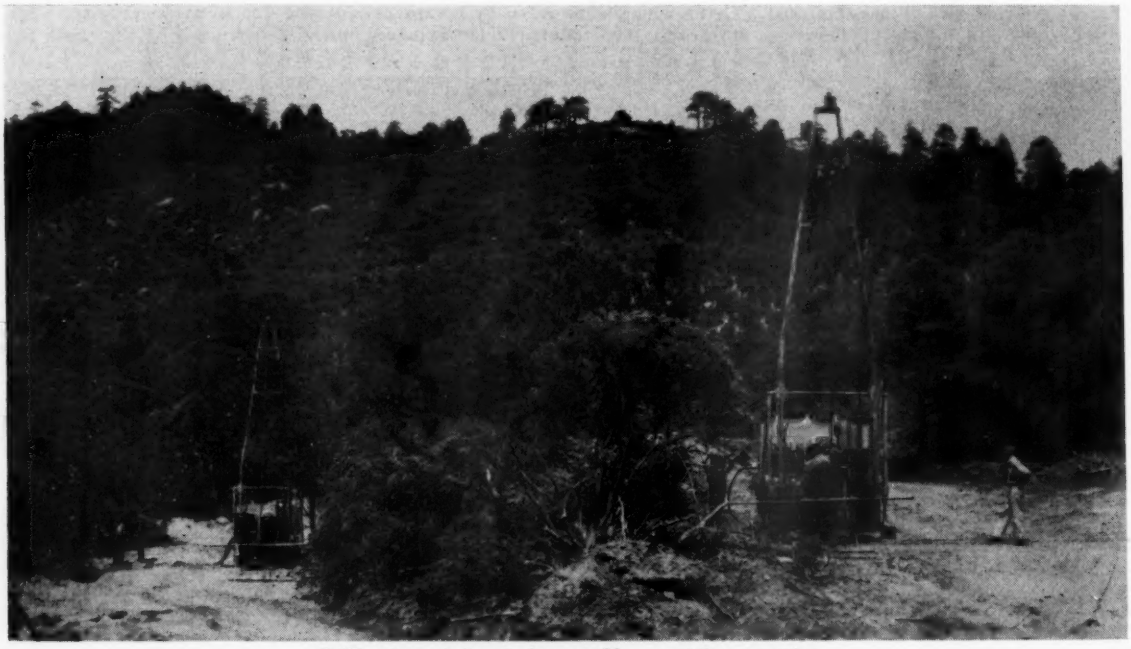
Rock bit drilling is greatly hampered by the various types of material which must be drilled. These vary from soft sticky clays to sandstones and include hard lime ribs and extensive layers of hard cherty conglomerates.

Another attempt to solve the plug bit drilling has been the use of churn drills. This generally has proved to be too expensive as the average rate of advance has been 35 to 40 ft per eight hr shift. Only two churn drills are now being used in conjunction with diamond drill contracts.

The most recent effort to solve the plug bit problem in hard cherty conglomerate layers is the use of NX double-cone reamer in conjunction with an AX diamond pilot bit. This is being used by one contractor in an attempt to eliminate the sticking of standard diamond bits in loosely cemented formations. The double-cone is set with strips of bortz, with congo stones on the reaming edges. To date this system has enabled drilling back through caved ground. Use of this cone reamer is new yet, but it is hoped that it will help solve the drilling of both hard and unconsolidated strata.

Reduction of drilling cost in the top part of the deeper holes will depend on the success of one or more of the new methods now being tried on the Colorado Plateau. Drilling costs have risen in much greater proportion than the increase in depths would indicate.

*(Continued on page 84)*



**Drilling is carried on in inaccessible, mountainous country**

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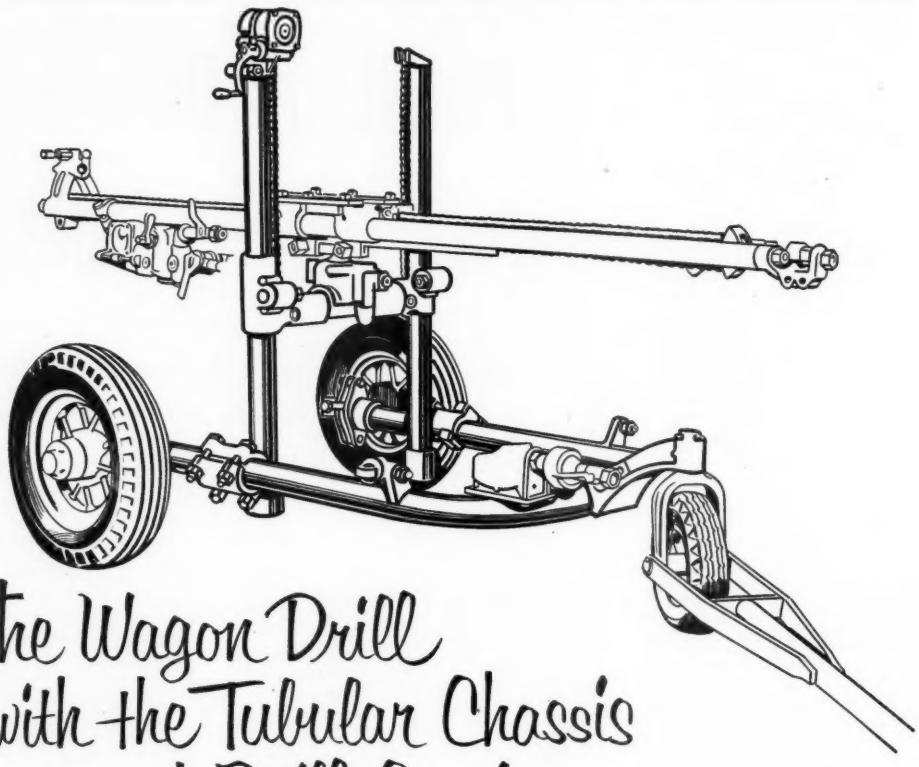

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G-300 Wagon Drill

The rugged tubular chassis and drill carriage of the G-300 WAGON DRILL provides rigidity and strength without unnecessary weight.

The tubular "H" structure that supports the drill carriage gives greater stability than the conventional design and minimizes vibration. The all-around sturdy construction of the G-300 maintains correct alignment at all times, insuring maximum drilling efficiency with minimum upkeep.

### G-300 Wagon Drill

- is designed to take full advantage of the high drilling speed and strong rotation of the CP 4-inch 70-N Drifter.
- has controls conveniently centralized.
- is equipped with a specially designed feed motor and cone-gear drive for greater load-carrying capacity.
- has a heavy-duty centralizer.
- adaptable for all types of wagon drill work. Wheels can be turned at right angles to facilitate line drilling or drilling close to a ledge or wall.

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# Eye Injuries in the Mining Industry

By DR. W. SCHWEISHEIMER
Rye, New York

EYE emergencies in industry have assumed a tremendous importance because of their number and their cost to both management and labor. Between 300,000 and 400,000 industrial eye accidents necessitating absence from work of one day or more occur each year in the United States.

Experience has taught that increased mechanization at the coal face has increased the risk from flying particles of coal dust, and is partly responsible for the steady rise in the accident rate. In the United States, where illumination in the mines is better than in other countries eye injuries are higher in coal mines. In quarries eye accidents are most common among granite workers.

## First Aid Important

It is far better to prevent these accidents than to treat them. Proper first-aid treatment by the attending physician will save millions of dollars and thousands of man hours and will prevent irreparable mental and physical injury to the injured persons.

More than 50 percent of all the eye accidents (nearly 4000) which occurred during one recent year in Minnesota and Illinois were caused by

## Proper Treatment of Eye Injuries Can Save Millions of Dollars and Thousands of Man Hours

flying particles set in motion by hand tools, machinery and various unclassified sources. The next most common causes were abrasive wheels, corrosive substances, electric flashes. A report by Dr. A. C. Snell on eye accidents in the United States says, "Flying particles—chips of steel, iron, brass and copper—set in motion by chisels, pneumatic hammers, mechanical drills, hand files and the like, cause more than one out of every two eye accidents in industry." Most of the eye injuries in mining are preventable.

## Don't Rub

Workers in the mining industries have always to do with materials that may easily enter the eye—sand dust, soil, coal particles, rock particles, etc. Even a small foreign body in the eye may produce bad effects. If some dust, a cinder, a wooden splinter, an insect or any foreign body gets into the eye the worst possible thing to do is to try to rub it out. The eyelids close automatically when anything threatens the eye. If a foreign body lodges somewhere on the surface of the eyeball an increased flow of tears often succeeds in washing it off. This is a most efficient first aid treatment and is accomplished by nature. The foreign body comes out at the corner of the eye.

If this natural method is not successful, the eye should be inspected. It may be possible to lift the foreign body off with the clean corner of a handkerchief or a clean piece of blotting paper. In the first-aid room, the eye may be irrigated with a non-irritation solution. Tears contain a disinfecting substance which will destroy a good many germs which may be present in the eye.

No attempt should be made to rub a foreign body off the cornea. If it does not come off on the blotting paper it is probably embedded. Any rubbing will implant it more deeply in the delicate tissue and make matters worse. Abrasions from coal often lead to the formation of an ulcer and serious damage to the cornea.

Many metallic foreign bodies can be removed with the help of an electromagnet. A small chip of metal from a hammer or chisel may strike the eye at high velocity and all that may be seen is a minute track in the cornea. A foreign body within the eyeball generally requires specialized care.

Where foreign bodies are embedded deep inside the eyeball, no magnet can reach them. Surgical removal of the foreign body may be necessary.

Extensive observation has disclosed that the left eye of miners is more frequently injured than the right. In a recent study up to 52 percent of the accidents reported involved the left eye, 36 percent the right eye and 12 percent both eyes.

## Conjunctivitis

When sand or dust irritate the eye, conjunctivitis may result. The conjuctiva is the delicate membrane that

*(Continued on page 52)*

**Many an eye has been saved because a worker was wearing safety glasses**

# 24 U. S. Rubber Conveyor Belts operate in Inland Steel's Price, Kentucky, Coal Preparation Plant

**BELT CARRYING** run-of-mine coal discharging into blending bin through tripper.

**BELT AT LEFT** takes ¼" x O raw coal from blending bin to surge bin. Belt at right conveys 5" x ¼" raw coal from blending bin to wash box.

In this modern coal preparation plant, 24 U.S. Giant Conveyor Belts carry run-of-mine coal, fine coal, rock and refuse through the various preparation processes. These belts range from 24" to 54" in width and vary from 37 to 1,786 feet in length—totaling 9,729 feet.

Consult the nearest United States Rubber Company branch office for complete information or write to the address below.

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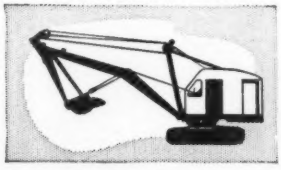
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

# Here's more digging force!

## Powerful LS-90 hoists and swings simultaneously

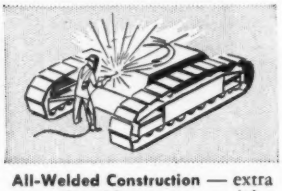
**OLIVER IRON MINING CO., at Mt. Iron, Minn.,** is building a new pilot Taconite plant—and the brute strength of this LS-90 serves on a broad range of the construction work. The LS-90, owned by Paul Degrugillier, is used by Stearns & Rogers Mfg. Co. on this big job.

**Here are LINK-BELT SPEEDER PLUS FEATURES that work for you**

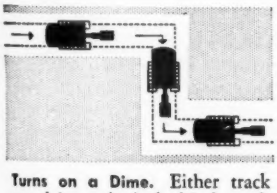


**Gooseneck Trench Hoe**—improved digging and dumping plus far less undercutting of the machine on deep cuts.

**Convertibility** — designed for peak production as shovel, crane, dragline or trench hoe. Convert in field—quickly, easily.

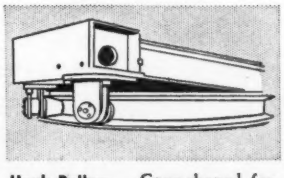


**All-Welded Construction** — extra strength without extra weight. Resists impact and twist. Field service simple, fast.



**Turns on a Dime.** Either track can drive or be locked independently. Digging lock controlled from cab.

**Self-Cleaning Crawler Treads** — eliminate compacting. Track shoe lug meshes with pocket in the drive wheel—ejecting material.



**Hook Rollers** — Cone-shaped for *true* rolling. Reduce roller and roller path loads—eliminate center pin pull.

**High Ground Clearance** — eliminates snagging or fouling in rough areas. No projecting castings or easily damaged parts.

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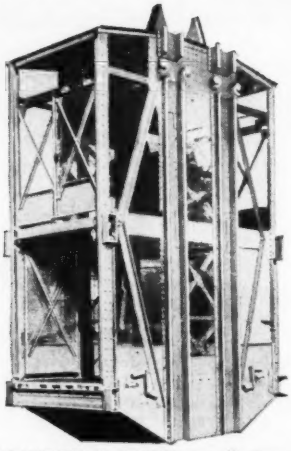

HOLMES HEAVY-DUTY CAGES in all sizes and types for rapid hoisting and low maintenance. Ask for complete information.

Increased mine production and efficiency—from the pit or shaft to the loading dock—are found today in hundreds of mines because of equipment pioneered by Holmes. Use this specialized experience to obtain the most advanced design, the best of materials and the latest methods of manufacture. Take advantage of this creative engineering and long-standing reputation for sturdy construction that assures efficient, dependable performance at a lower over-all cost. Call on a Holmes Mine Equipment Engineer for consultation in the planning and development of your requirements. There is no obligation.

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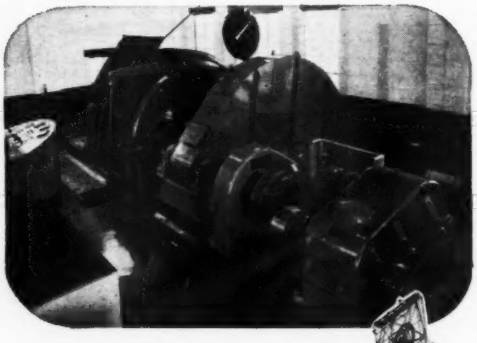

**Holmes Advance Design Hoists** feature the latest and most complete control equipment. Ask for complete information.

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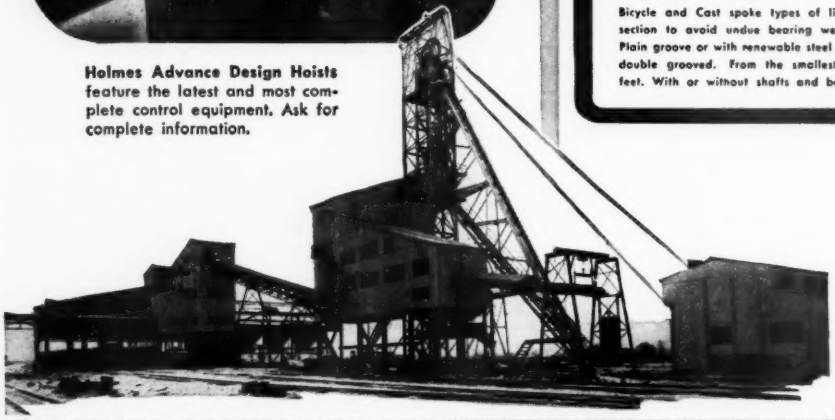
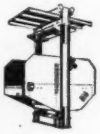


Peabody Coal Company's new mine No. 17 at Pana, Illinois, is equipped with Holmes Hoisting Equipment.

SHEAVES

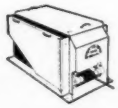
TIPPLE EQUIPMENT



CAGES

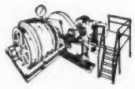
SKIPS

LOWERING SPIRALS



CAR PULLERS AND RETARDERS

LABORATORY CRUSHERS



HOISTS

VIBRATING SCREENS

DUSTOLATORS

# With the *Defense Agencies*

By HARRY L. MOFFETT

WITH the termination date of the present Defense Production Act drawing near, materials controls continue to ease as supplies of metals increase. Meanwhile resentment has heightened over the administration of wage and price controls. Price control is becoming more and more a vehicle to regulate profits, while the so-called wage control is turning into a spiral of "wage stimulation." Congress is expected to admonish the price administrators to suspend price controls where prices in an industry fall below OPS ceilings; the legislators may also throw out the present Wage Stabilization Board and convert it into an all public member board.

While Congress debates over the revised Defense Production Act, agencies of the Government responsible for mineral and metal output continue their drive to help mining meet production goals.

## DMPA Reports Progress

DMPA Administrator Jess Larson has reported "substantial" progress in the program to step up production of metals and minerals. He has predicted that when the mineral expansion projects, currently under way, are brought into production, the United States will be able to meet all defense needs for most of the principal metals and minerals and to supply more to the civilian economy.

Larson summarized DMPA agreements with industry for the production of major strategic metals and minerals and the expected results as follows:

*Copper*—six commitment-to-purchase contracts, one loan and 12 certificates of necessity are expected to result in an additional 400,000 short tons of copper for the period 1951-56, with a maximum annual expansion by 1956 of 165,200 tons.

*Chrome*—one purchase depot has been established to buy chrome ore at an over-the-market price and one commitment-to-purchase contract has been negotiated for 900,000 tons of chrome ore for the period 1952-56.

*Cobalt*—seven domestic and foreign contracts, with advances against production, and one certificate of necessity are expected to result in an additional 22,313,000 pounds of cobalt during the 1951-56 period.

*Fluorspar*—expanded production of 240,000 tons of acid-grade fluorspar over the 1952-56 period is expected to result from two guaranteed floor price contracts and four certificates of necessity.

*Iron ore*—expanded production of 41 million long tons of iron ore annually by 1955, and 7.8 million long tons of taconite annually by 1956, is expected to result from 106 tax amortization certificates.

*Lead*—maximum annual expansion of production by 1955 is estimated at 50,000 short tons with a total accumulative increase for 1951-56 of 194,600 tons.

*Nickel*—four commitment-to-purchase contracts, domestic and foreign, and one certificate of necessity are expected to result in a total of 112,750 tons of nickel during the 1951-56 period, with maximum annual expansion in production by 1956 of 28,900 tons.

*Manganese ore*—a purchase program coupled with loans and individual purchase contracts are expected to expand production by 1,070,000 tons during the 1951-56 period, with a maximum annual expanded production of 247,000 tons by 1953.

*Titanium*—certificates of necessity and purchase commitments are expected to bring out 19,150 tons of additional primary titanium over the 1951-56 period, with a maximum annual production of 4,510 tons by 1954.

*Tungsten*—no figures as to expansion are given but the summary states that the tungsten purchasing program and other forms of Government aid are resulting in substantial additional quantities.

*Zinc*—total expanded production of zinc through Government assistance is estimated at 856,600 tons over the 1951-56 period with a maximum annual expansion of 214,500 tons by 1954.

Larson reported that as of May 1, DMPA had received a total of 1,622 applications for Government assistance, of which 455 had been withdrawn and 605 denied. A total of 369 had been approved and put into effect.

DMPA has recently negotiated contracts with the American Chrome Co., San Francisco, for the production of chrome concentrates and with the Fansteel Metallurgical Corp., North Chicago, Ill., for production of columbium and tantalum. The minerals agency has also held a meeting with Lake Superior iron ore producers at which important problems relating to the exploration and development of iron ore properties in the Lake Superior District were thoroughly discussed.

The agency has established a Government-guaranteed purchase program for columbium and tantalum ores and concentrates in which an incentive bonus is offered which will approximately double the current market prices. Life of the purchase program is until December 31, 1956, or until the government has acquired 15 million pounds of columbium plus tantalum pentoxide contained in ores

and concentrates of acceptable grade, whichever occurs first.

Meanwhile, it has been announced that James Douglas, who has been serving as Assistant Deputy DMPA Administrator, has been sent to London as Deputy Director of DMPA's new regional office there.

## DMPA Certifies Five Discoveries

Five new discoveries or developments of strategic minerals have been certified by the Defense Minerals Exploration Agency under its exploration program, bringing to eight the number of discoveries so far certified.

The new certifications include: (1) new deposits of monazite on the holdings of the Ruby Meadows Mining Co., Idaho County, Idaho; (2) a discovery of sulphur on property of the Continental Sulphur and Phosphate Corp., Park County, Wyo.; (3) a tungsten discovery by American Alloys Metal, Inc., Beaverhead County, Mont.; (4) a strategic mica discovery on the holdings of Fred D. Cabe, near Franklin, N. C.; and (5) a discovery of beryl and strategic mica on the property of Lewis W. Collingwood, Custer, S. D.

The agency has issued a new form, MF-103, to simplify the filing of an application for Government aid in an exploration project. This new form contains only seven questions.

## DSFA Appointments

Defense Solid Fuels Administrator Charles W. Connor has named Adolph P. Wunderlich, superintendent of car service for the New York, Chicago and St. Louis Railroad, of Cleveland, as Director of DSFA's Transportation Division, and Victor L. Vaughan, project engineer of the Clinchfield Coal Co., Dante, Va., as an industry specialist in the Agency's Industry Finance Division.

Wunderlich succeeds Walter J. Howard of Philadelphia, who has returned to the Pennsylvania Railroad. Vaughan will assist in DSFA's analysis of applications from solid fuels producers for rapid tax amortization and defense loans.

## Mining Machinery Production Expansion

The mining machinery manufacturing industry has been called upon by DPA to add another $6 million to its capital investment by January 1, 1954. The production agency said that because of additional mechanization of present mines and the opening of new mines to expand mineral output, the demand for mining machinery increased 60 percent from the end of 1950 to the present time. The agency said that peak demand for this equipment will be reached late in 1953.

Meanwhile, manufacturers of mining machinery have been told by NPA officials that "order board" information will be requested monthly from producers of kilns, coolers, driers, crushers of all types, ball mills, mine hoists, screens and ore dressing equipment, all described as being in tight supply. NPA said that deliveries of these items greatly exceed normal shipping promises or lead times. The agency said it was asking that the shipping schedules be submitted monthly rather than quarterly, to provide a guide for determining which companies could best handle new urgent orders without disrupting their other orders.

The industry also was informed that NPA is about to amend Order M-78 to raise the dollar limitation for the self-certified acquisition of minor capital additions, from $2,000 to $5,000. This would eliminate the need to obtain spot-basis ratings for many small items required for day-to-day operation, and would reduce paper work considerably.

## CMP to Remain

Henry Fowler, who has assumed the post of Defense Production Administrator, succeeding Manly Fleischmann who has returned to private life, has declared that there will be no abandonment of the Controlled Materials Plan this year. He has said that controls must be maintained for copper, steel, aluminum and nickel, although more "flexibility" may be built into the CMP structure. He also predicted that paper work will be considerably reduced.

Fowler has indicated that as the supply of metals increases the CMP controls will be eased. To date many restrictions, previously imposed upon strategic metals under allocation control, have been lifted. Latest action by NPA removed the allocation controls over zinc but retained inventory controls and machinery to reimpose the controls if found necessary.

## Civilian Stockpile Established

The Government has officially established a "civilian stockpile." It will operate side by side with the military stockpile. DPA has authorized the purchase of up to 30,000 tons of lead by the end of this year, which may be sold either to industrial users or to the national stockpile. Officials have indicated that similar programs for other metals are under consideration.

Meanwhile, stockpile officials indicate that faster purchases for the national stockpile may be in the offing. Acquisitions for the stockpile have fallen far behind schedule in the past few months, and officials hope that, with large supplies of metals becoming available due to lessened demand and increased output, they may go into the market and maintain not only their normal purchasing program but make up some of the deficits that have accrued. Substantial funds are available for this purpose.

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## Eye Injuries in Mining

*(Continued from page 47)*

lines the eyelids and covers the white of the eye. Conjunctivitis is the inflammation of the conjunctiva produced by mechanical irritation, by intense light or glare of the sun or by rough weather conditions.

The first thing the miner feels is itching and burning and an unpleasant sensation of grit under the eyelids. A sticky secretion is poured out from the conjunctiva. In the morning the edges of eyelids and eye lashes are glued together, a most typical sign. The eye may become painful and exposure to bright light causes acute discomfort.

Cold compresses may relieve the painful sensation until local treatment is started by the doctor. A shade and dark glasses will protect the eye if light is painful.

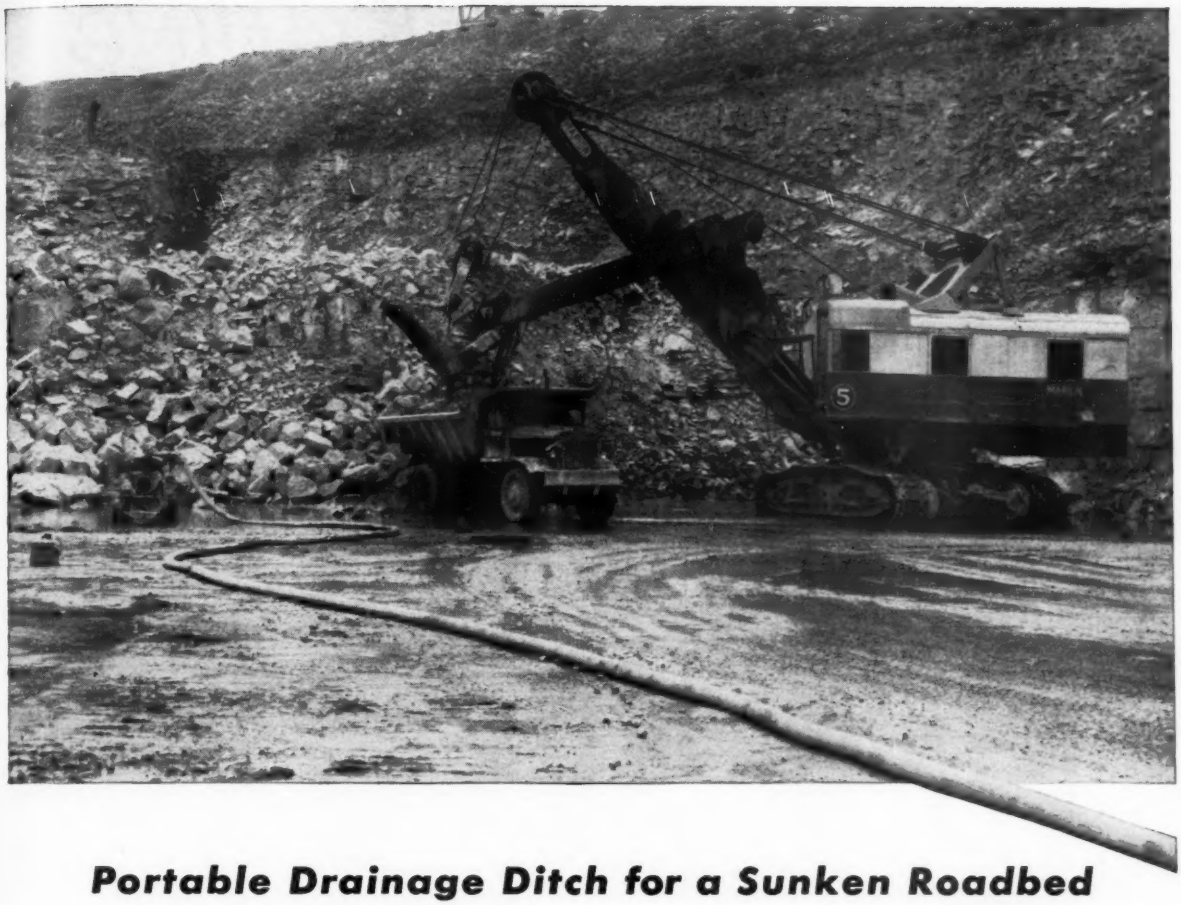
## Wear Your Goggles

Miners often do not wear the protective goggles with which they are supplied. But goggles are necessary in high velocity dust-laden air currents and in certain processes at the coal face and should be worn at all times.

## Don't Delay Treatment

A good many foremen and workmen in the mining industries are well trained in the proper kind of first aid for eye injuries. Improper attempts to remove a foreign body from the eye have sometimes seriously damaged the eyesight. But under normal conditions the surface of the eye heals with great speed and without lasting damage.

In mines it is not practical for every worker with a slight eye injury to go to the surface for first aid or medical treatment. As Dr. D. A. Campbell points out all aid stations above and below ground should have equipment for the treatment of minor eye injuries, and all cases of eye injury should receive adequate first-aid treatment at the earliest possible moment. In case of serious eye injury the injured man should be removed to a hospital immediately.



## *Portable Drainage Ditch for a Sunken Roadbed*

● The rock floor of this limestone quarry, nearly a hundred feet below ground level, presents a constant drainage problem.

Men and equipment must be free to work around the clock in any kind of weather . . . free to work despite rain squalls, spring thaws or the gradual seepage of surface water through the overburden.

And, since the work location shifts as each load of stone is removed, the drainage facilities must be able to move with the shovels.

Getting the water off is a job for hose . . . a tough, flexible water carrier that can be dragged over abrasive surfaces, subjected to falling rock, snaked into out-of-the-way crevices and lengthened or shortened at the turn of a coupling.

The Bessemer Limestone Company, a Republic Rubber customer for more than a generation, uses Republic's Water Hose for this purpose.

They use Republic Hose because it stands up better, handles easier, lasts longer on the job.

Water Hose is just one of Republic's complete line of Industrial Rubber Products that is quality built and sold through Republic Distributors who are experts in their job of helping you select and apply the right hose or belt for your specific job.

Your Republic Distributor is ready to make a complete, free analysis of your requirements now. Contact him or write us today for full facts on how this analysis results in better performance, better service and less costs for you on the job.

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Because coal is so useful, it's important to all of us that America's coal industry is the world's most efficient —that America's vast coal reserves can supply the nation's heat, light and power for centuries to come!

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From the compact Model 200 to the heavyweight 600... here is drilling versatility to meet every hard rock requirement.

REVERSE FEED MODELS are now available in all sizes, permitting column or bar-mounting as shown in illustration above.

Simple design, air cushioning, extra large bearing surfaces and other features keep these tools on the job longer, *sharply reduce out-of-service repairtime.*

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**STOPER LEG**

Adapts Thor No. 38 Sinker to double duty as either Sinker or Stoper — Air Feed Leg bolts directly on cylinder, replacing Sinker backhead, Write for Circular JE-1132.

Thor PORTABLE POWER TOOLS

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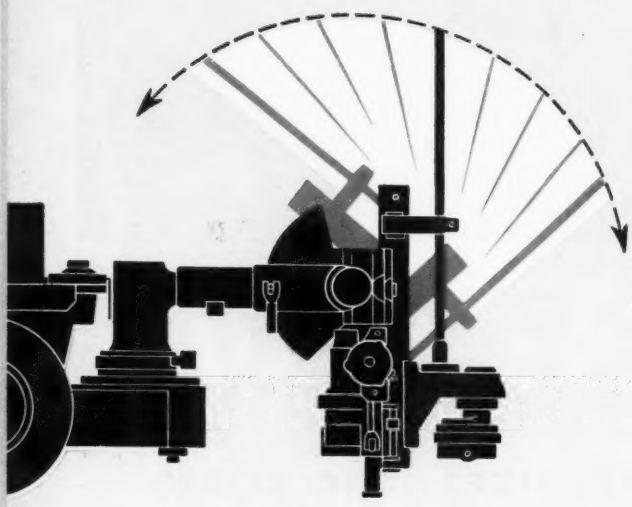
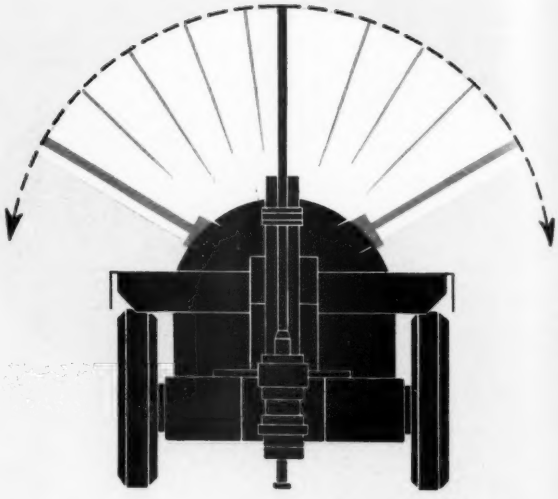
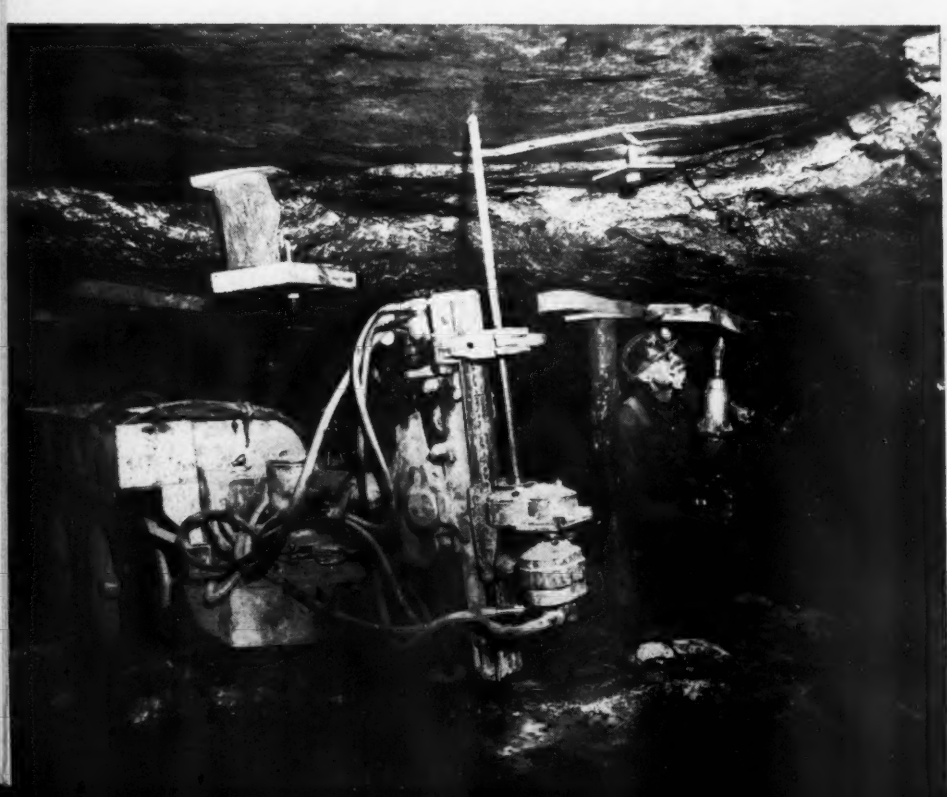
# ROOF-BOLTING



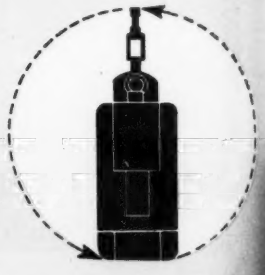
Side view of a Joy Hydraulic Roof Bolting Drill which illustrates the forward-backward tilting action possible with the unique Joy full-swiveling frame.



Front view of a Joy RBD, illustrating the full side movement possible. This and the forward-backward action, at left, permits drilling at any angle normally desired.



**RBD-10**—FOR TIGHT PLACES
A compact, self-propelled unit only 31″ high, 36″ wide and 8′ 10″ long. Unique tractor-type steering enables it to turn in its own length! The small size, easy maneuverability, and simple controls suit it for work in very restricted areas. Power is by a 10 or 15 H.P. hydraulic-pump motor.



TOP VIEW OF THE RBD-10 . . .
CAN TURN IN ITS OWN LENGTH

# AT *ANY* ANGLE with JOY HYDRAULIC ROOF BOLTING DRILLS

The drilling mechanism of JOY Hydraulic RBD Roof-Bolting Drills is mounted on a FULL-SWIVELING FRAME which permits operation at any angle necessary to compensate for pitching seam or rolling bottom. The angle of the roof-bolt is decided by the OPERATOR, *not by the slant of the floor.* As a result, only with JOY RBD Drills can roof-bolts be placed at exactly the proper angle for maximum support and safety.

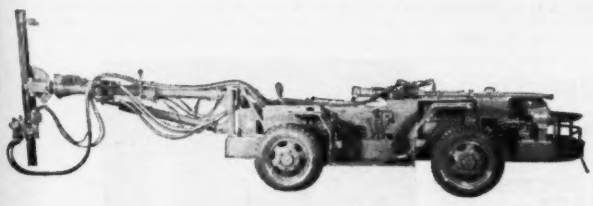
Longer feeds necessitate fewer time-consuming steel changes. Variable feed speeds and rotation speeds provide instantaneous compensation for varying hardnesses in the roof strata.

A central hydraulic system controls tramming, steering, drill rotating, drill feeding, and boom swinging on most models. To facilitate manipulation while tramming, the operator can swing, raise and lower the boom from his platform.

Three models of hydraulic impact-wrench attachments are available to run the bolts onto the expansion shells or tighten the nuts on split-wedge bolts. No other bolting machine is necessary.

The high drilling speed of RBD Drills, their flexibility, and their easy handling permit high capacity trackless mining with a very small bolting crew. ● Let us *prove* how JOY RBD Drills will step up your mining efficiency through faster, easier and safer roof-bolting.

**RBD-8—STANDARD FOR MOST JOBS.** The RBD-8 is powered by a 15 H.P. hydraulic-pump motor. Hydraulic controls simplify operation. The 9′ 1¾″ boom may be swung 60° to either side, permitting a horizontal drilling width of 15′ 4″.



**RBD-11** A twin-boom version of the RBD-8. Standard booms provide a drilling width of 23′ 10″—29′ is possible with extended booms. 26 H.P. hydraulic-pump motor.

**RBD-7** Unmounted unit with same specifications as the RBD-8. Can be mounted on a mine car, shuttle car, or other machinery at hand.

**RBD-12** Track-mounted unit similar to the RBD-8.

*Consult a Joy Engineer*

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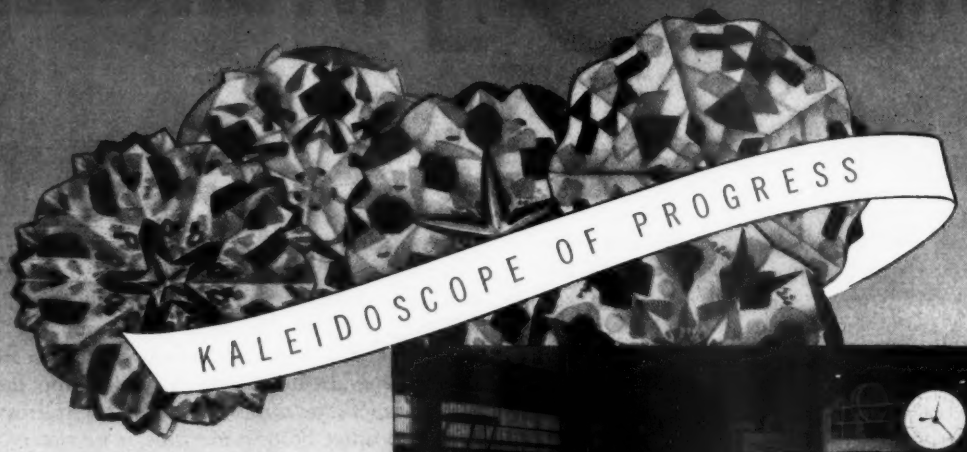
# Steel

## BULWARK OF FREEDOM AND...

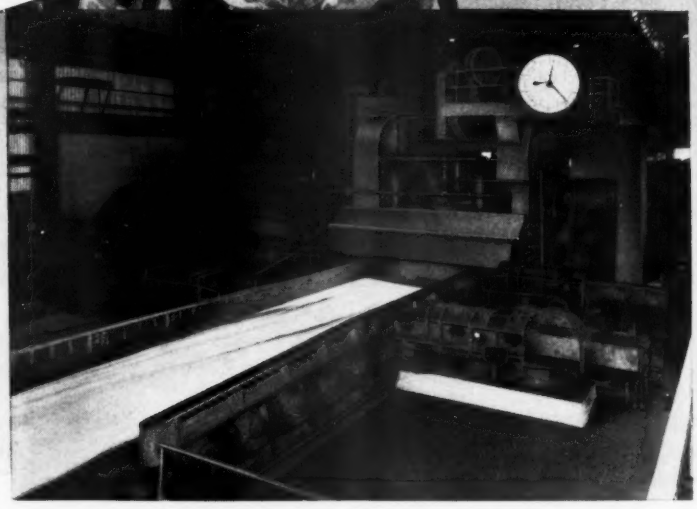



The changing pattern of progress, West of the Mississippi and East of the Rockies, is readily traced through the pages of Sheffield history.

First products of record were produced in 1888 to meet the needs of the great railroad building expansion. Following the rail lines came the fabulous development of agriculture, construction, mining, highways, manufacturing, oil and ship building.

Each of these facets of industry presented needs for steel in different shapes and forms. In meeting such kaleidoscopic requirements, the Sheffield organization acquired a vast accumulation of skills, techniques and facilities and, today, produces a wider diversity of steel products than any other similar steel making set-up in the country.

Some phases of Sheffield Steel production have expanded 3½ times in the last 10 years while Sheffield's overall production has more than doubled.



**Fast and Powerful New Plate Mill**—Fabricators of such steel products as pressure vessels, processing and storage tanks for liquids and gases, transportation line pipe, etc., require plate steel in far greater quantities than the slow cumbersome plate mills of yesteryear could produce. A new, powerful, 4-high plate mill at Sheffield's Houston works now rolls white hot slabs into long lengths of steel plate in a matter of minutes for shearing into sections to meet fabricators' needs.

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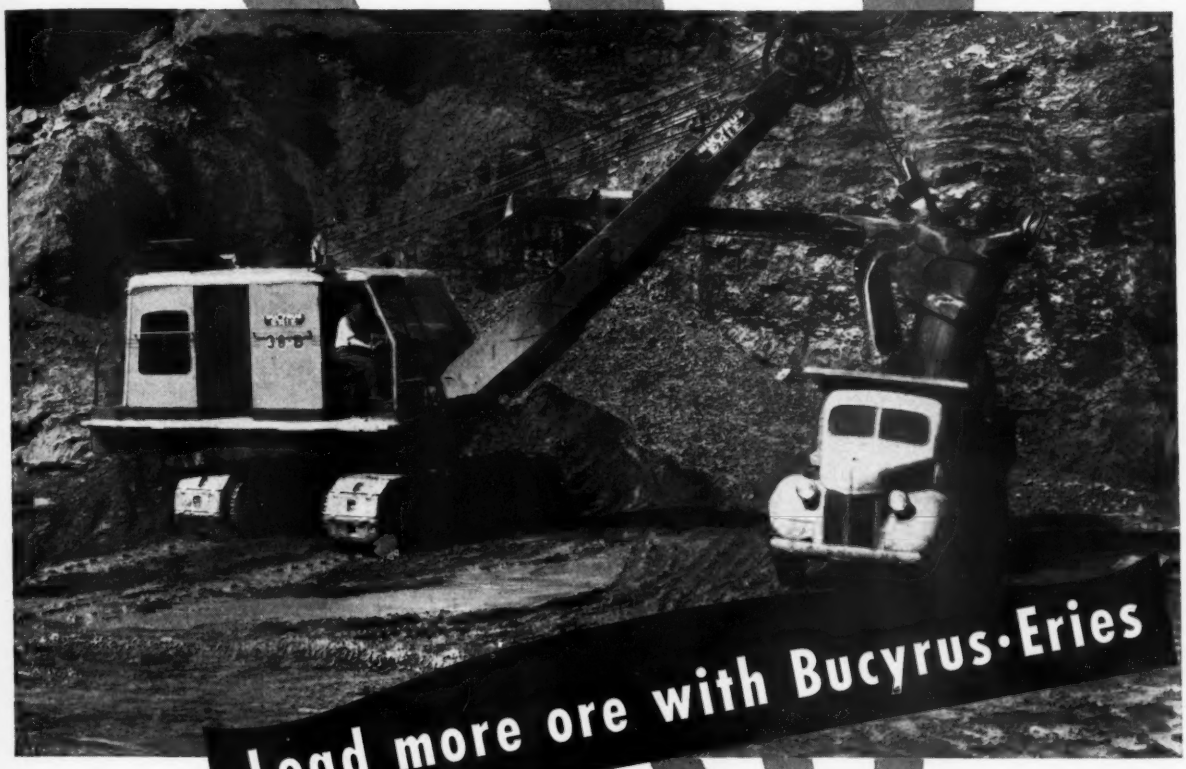
## speed speed speed



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For more than five decades the fastest, most efficient ore-loaders in the mining world have been Bucyrus-Eries—acknowledged leaders in their field. That's because their high output features help get the ore out in a hurry—features like smoothly balanced machine speeds and power, coordinated by direct-connected mechanical controls; anti-friction bearings liberally used to assure smooth, steady power flow; and easy-filling dippers to scoop up full loads of ore on each pass, dumping quick and clean with wet or dry material. True simplicity of design and large, strong parts easily accessible for maintenance keep your output high, downtime low —especially important when operating far from repair facilities.

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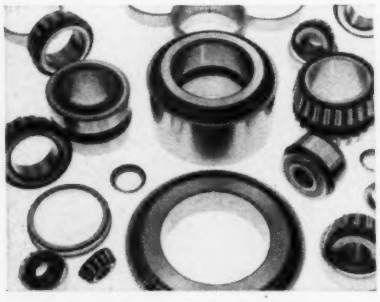
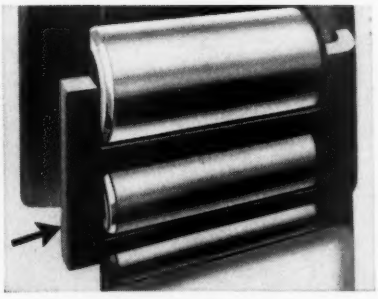
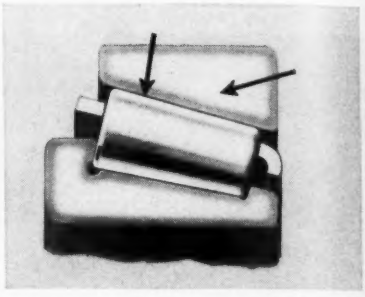


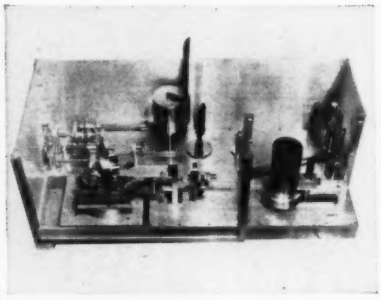
**26 TYPES.** Because Timken® bearings are made in 26 types, you get exactly the right tapered roller bearing for your job.



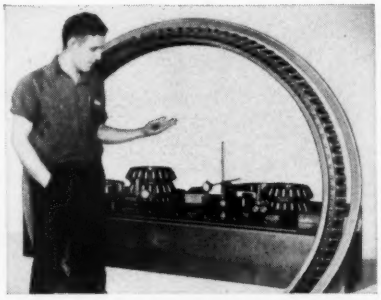
**SOFT STEEL CAGE** separates the rollers in Timken tapered roller bearings and prevents scuffing.



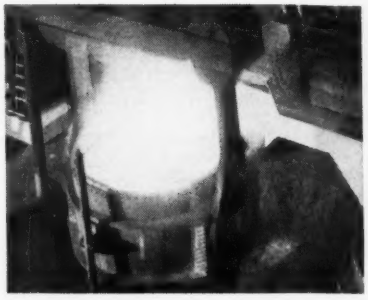
**TOUGH INSIDE—HARD OUTSIDE.** Case carburizing of rollers and races gives a wear-resistant surface, shock-resistant core.



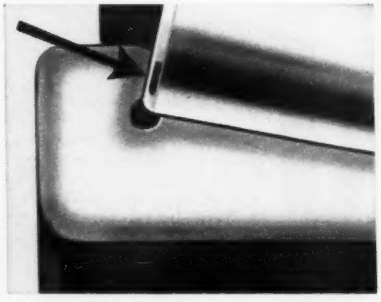
**MICRO-INCH FINISH.** With help of the profilograph, which measures surface irregularities to a millionth of an inch, the Timken Company has developed a bearing finish of micro-inch accuracy.



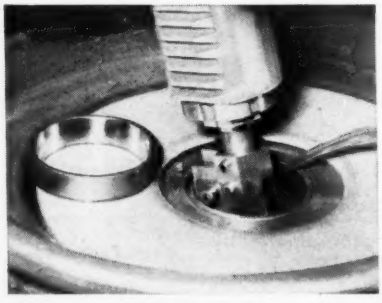
**5850 SIZES.** If you need a tapered roller bearing smaller around than your finger or as large as 71½" in diameter, you can get it from The Timken Roller Bearing Company.



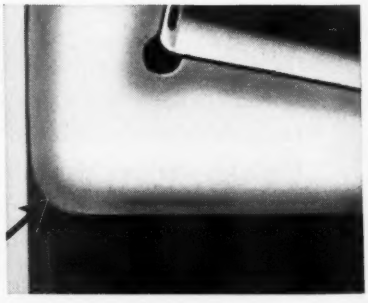
**WE MAKE OUR OWN STEEL.** Because Timken bearings are made of special alloy steel, produced in the Timken Company's own mills, they have extra strength and wear resistance.



**RIB OF CONE** maintains roller alignment, prevents skewing, assures maximum bearing capacity.



**PRECISION MANUFACTURE** makes possible bearings with a maximum runout tolerance of less than 75 millionths of an inch.



**GENEROUS RADIUS** on the inside diameter of Timken bearing cones permits greater shaft strength.

No other tapered roller bearing gives you all the advantages you get with Timken bearings. Be sure every tapered roller bearing you use carries the name "Timken", the trade-mark of The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

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***TAPERED ROLLER BEARINGS***

NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Opening session considered future coal markets and Government controls

# 1952 Coal Convention

## With Every Session Crowded and Each Entertainment Feature Better Than the Last, the Meeting Was a Huge Success

HELD in Cincinnati May 5, 6, and 7, the 29th Annual Coal Convention was one of the largest and best attended American Mining Congress meetings ever. Almost 2,000 were present to take part in the technical and general sessions. Every one came away with new ideas and a different slant on old ideas. These will be reflected in improvements in the nation's coal mine operations, and will result in greater production and better safety figures for years to come. The intense interest in the papers presented was evidenced by the fact that at many sessions there was "standing room only."

Under the direction of Kenneth A. Spencer, Program Committee Chairman, a well rounded and up-to-the minute program had been formulated. Each speaker invited to address the convention was a recognized authority in his particular field. Months of hard work paid off in a meeting second to none.

### Progress is Inspirational

On Monday morning Julian D. Conover, Executive Vice-President of the Mining Congress, opened the convention with a few brief remarks, during which he said, "It is you people attending these conventions who have made this progress possible, progress which has made our mechanized mines the marvel of and the source of inspiration to other coal producing countries. One thing we must never forget for a moment is that all this has been done without Government intervention, under our system of free enterprise and free competition. Today that system, which has made our country great, is in jeopardy. Certainly we are in a bad way when officials, who have sworn to uphold the Constitution, take the position that the President, on his own volition, can take over private property and that the Courts cannot even review the matter.

"Fortunately a Federal judge in

K. A. SPENCER

Although Mr. Spencer, Program Committee Chairman, could not be at Cincinnati, his influence was felt in the well-rounded program.

The Manufacturers Division held its annual meeting on Monday afternoon

Washington has acted promptly, with courage and decision, and the matter is now before the Supreme Court, as the final guardian of our constitutional liberties."

He went on to pay a compliment to those in the Government Agencies having to do directly with mining. "In conducting our business today," he said, "We run into all kinds of controls and government regimentation. In our case we are fortunate in having at the head of the Government agencies, responsible for the production and supply of coal and other minerals, some level-headed men from our own industry who have seen to it that the control programs are administered fairly and with a view to the industry's welfare."

## Great Future Predicted

H. H. Taylor, Jr., chairman of the opening session introduced Joseph Pursglove, Jr., who traced the future course of the coal industry and coal utilization. His talk gave substance to the feeling that we are standing on the threshold of a great new era.

Charles W. Connor, Administrator of Defense Solid Fuels Administration, spoke on "Materials and Machinery for Coal Mines." Mr. Connor was followed by Edward T. Klett, Deputy Administrator, D. S. F. A., and Harold A. Montag, Director, Mining Machinery Division, National Production Authority, who expanded on the same topic.

Much interest was shown in the strip mining sessions

At a luncheon held in the Hall of Mirrors, L. C. Campbell, Chairman, Coal Division, American Mining Congress presiding, Thomas E. Millsop, President of Weirton Steel Co., Mayor of Weirton, W. Va., and recent recipient of the Horatio Alger Award spoke on "Businessmen in Politics." He emphasized the need for the entrance of businessmen into Government, the world's largest business, at local, state and national levels.

The technical part of the convention began on Monday afternoon and the sessions dealing with Roof Support and Strip Mining were crowded to capacity. Extracts of the excellent papers given at these and the other technical sessions on succeeding days appear on the pages which follow. Let it suffice to say here, that every meet-

Dr. McFarland kept the Tuesday luncheon guests well entertained

L. C. Campbell, Chairman of the Coal Division, introduced visitors from Scotland and England

ing room was crowded and the discussions, that make these meetings so valuable, were spirited and brought out many additional points.

## Program Success Due to Many

It would be unjust not to give due credit to the Session Chairmen, the men who saw to it that the program went off without a hitch and who led the outstanding discussion periods. These men in addition to H. H. Taylor, Jr., were J. W. Woomer, F. F. Kolbe, C. E. Lawall, James Hamilton, W. B. Jamison, J. T. Parker, E. R. McMillan, J. B. Morrow and George A. Roos.

Frank G. Smith and his hard-working Floor Committee were present at all sessions to work with the chairmen. To them, also, is due a vote of thanks for helping to make the convention the success it was.

## Coal Miners Party

Monday evening the conventioneers and their ladies all enjoyed the Coal Miners Party at Cincinnati's famous Coney Island. They were treated to an evening of top notch ente.tainment and dancing plus a delicious buffet supper on the lawn and inside the beautiful Moonlite Gardens. Many took advantage of the opportunity to ride the carousel and other attractions of the amusement area, open especially for them.

Charles B. Stainback, chairman of the Manufacturers Division, American Mining Congress presided over the luncheon on Tuesday. The guest speaker was Dr. Kenneth McFarland, Educational Consultant, General Motors Corp. His excellent talk, "Four Buckets of Paint" pointed out that every man has a stake in his particular industry and company and that upon the way he represents it, depends its success or failure.

## Reds vs. "Bums"

Baseball claimed the attention of nearly everyone on Tuesday night. A game between the Cincinnati Reds and the Brooklyn Dodgers was witnessed by over a thousand coal mine operators and manufacturers of mining equipment. The special American Mining Congress Section kept the group together, making it even more enjoyable. Those who were not at the ball park spent the evening looking up old friends and visiting back and forth. There was probably more coal mined on Tuesday night than during the entire working year. Friends, old and new, swapped stories and told the latest news at many private parties. After the ball game the ranks of those circulating were swelled by the fans,—and the coal mining continued far into the night.

## Banquet Entertainment Tops

The Annual Banquet on Wednesday evening was the high point of coal mining's social year and the climax of the convention. The Hall of Mirrors at the Netherland Plaza Hotel was filled to capacity; in fact it overflowed with people who obviously had a great time. After an excellent dinner the tables were cleared and Toastmaster R. E. Snoberger introduced the distinguished guests at the head table, absolutely without speeches. With these formalities out of the way the brilliant crowd settled back to enjoy "An Evening with Victor Herbert." The consensus was that this was the finest entertainment ever presented at a Coal Convention.

The infectious melodies of the fa-

With luncheons, bingo and sightseeing trips, the ladies were also kept busy

"An Evening with Victor Herbert" was an evening that will long be remembered

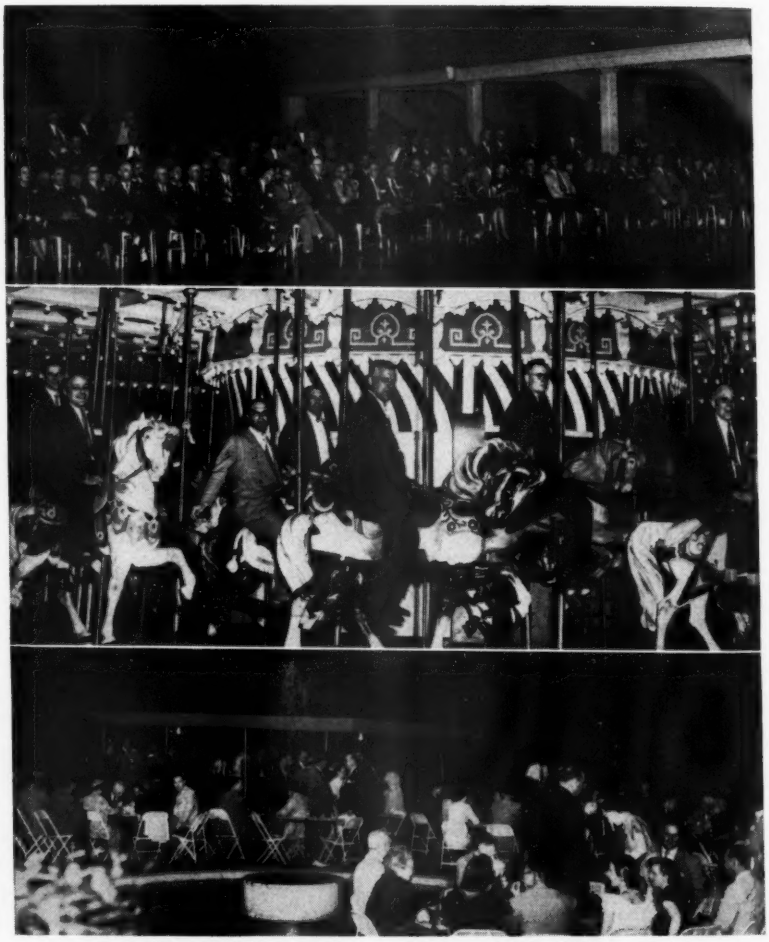
miliar operettas followed one another in rapid succession. The numbers were timed perfectly and the voices of the performers were matched only by their fine interpretations of the lilting tunes. There was not a single let-down in the hour and a quarter long program. Everyone present agreed that the show was "out of this world."

## Special Ladies Program

Ladies who attended the 1952 Coal Convention were treated to a program of special entertainment while their men attended the sessions. On Monday a luncheon was held for them in the Restaurant Continentale of the Netherland Plaza Hotel followed by a conducted tour of the Kroger Food Foundation. Tuesday's event was luncheon and Bingo at the "Copper Stallion," Ohio's newest country restaurant. On Wednesday they visited the Taft Museum and the Rookwood Potteries. They thoroughly enjoyed the Coal Miners Party and the Annual Banquet was the highest point of the program for them also.

## Looking to '53

Although the 1952 Coal Convention is now history, it will not be forgotten. Many people are planning now to attend the 1953 Coal Convention and Exposition which will be held in Cleveland. All indications point to a great show and much of the groundwork has already been laid to assure its success. Holding many of the answers to the ever changing problems of coal production, the 1953 Coal Show promises to surpass all others in size and interest.



Food, fun and frolic were the passwords to the Coal Miners Party

# Convention Papers

**Abstracts of papers presented at Convention Sessions are given in the following pages. The full text of each, together with discussions and illustrations, will be published in "Coal Mine Modernization—1952."**

## ROOF SUPPORT

### Wet and Dry Roof Drilling With Compressed Air Drills

By C. E. LINKOUS
*Director of Safety*
Island Creek and Associated Cos.

ISLAND Creek introduced mine roof bolting in the early part of 1949 with conventional air equipment including track-mounted compressors, stopers and impact wrenches. The mine roof was known to contain free silica ranging from 7 to 55 percent, which presented a definite silica hazard. Dust control was therefore important.

At first thought, it would seem that controlling the dust from rock drilling should be elementary and not too expensive. It is quite simple to use water in horizontal drilling as the dust is trapped in the hole and washed out of the collar of the drill hole. But drilling of roof-bolt or vertical holes presents several different problems.

The most common and best method is used; namely forcing water through the hollow drill steel at a pressure of approximately 60 psi. Success with this method depends principally upon maintaining sufficient flow of water through the drill continuously, during the entire drilling operation, and yet not wasting any. High dust concentrations result if insufficient water is used. However, this method is opposed by most all of the drillers as a very "messy" operation. It is almost impossible to get the drillers to use water voluntarily, when "starting" or "collaring" drill holes. It is also true that the wetness underfoot is objectionable and the water has an adverse effect upon mine floor.

Impinger samples collected in working places, where drilling was done wet, showed in all instances an average dust count about half the permissible maximum. For example, the average of six sets of samples taken where wet drilling was practiced, showed 10,900,000 particles per cubic foot (m.p.c.f.). An average of 20 m.p.c.f. is considered safe working atmosphere.

To overcome some of the adverse features of wet drilling, trial installations were made of at least four different types of dry dust collectors produced commercially and others developed locally. After considerable experimentation it was decided to standardize on a locally developed unit. At the present time more than 50 of these are being used and all have given satisfactory results. One man can move and set it up with ease.

The operating principle is similar to that of most of the others tried. An air jet is directed past the dust source and the mixture of air and dust picked up is conducted to a canvas bag. The device used to collect dust, from the collar of the hole is a do-nut affair held in place by a leg similar to the one on the stopers. The collecting head is provided with a sponge-rubber gasket to afford an adequate seal. A tight rubber seal is provided at the bottom of the head where the drill steel passes through during drilling operations. Both seals are vital to the dust-collecting efficiency and also govern the performance of the other parts of the collector. Constrictions are kept to an absolute minimum and every effort is made to utilize gravity in removing the drill cuttings from the hole. Removal of the dust load from the air passing through the collector is accomplished by filtration.

A recent dust survey conducted where dry collectors were being used revealed that the dust concentration at the breathing zone was less than five m.p.c.f. and the silica content was slightly less than 50 percent. Thus the free silica was slightly more than two m.p.c.f. The company is convinced that dry dust collectors will do a far better job of controlling the dust produced by pneumatic percussion drilling than wet methods. These dust collectors used throughout the drilling operation, including collaring of the hole, actually provide full-shift protection.

### Wet Roof Bolting With Rotary Electric Drills

By LOUIS F. LUMAGHI, JR.
*President*
Lumaghi Coal Co.

THE Lumaghi Coal Co. is using roof bolts in one section of its mine near Collinsville, Ill. Entries are driven 14 ft wide and rooms and room cross-cuts 24 ft wide. Pillars are not recovered.

The roof is five to eight ft of laminated black slate overlain by a strong limestone. In rooms where the slate is good it can be supported by 14-ft bars set 4 ft apart with a prop on each side between the end of the bar and the rib.

Bolting is done with a Jeffrey roof drill which pulls a trailer carrying a 300-gal water tank and a rack for the bolts. The drill stem is a plain steel tube 15/16 in. in diameter with a 0.30-in. bore. Water is directed to the

point of the drill and also comes out through the holes for the key.

This type of installation was selected because of success in using rotary drills in sinking a slope, which went through several hard limestones as well as shale. Drill cuttings, on analysis, showed from 11 to 52 percent free silica content, indicating a serious health hazard, which is removed by drilling wet. The water also keeps the bit cool and increases its life. A little less than two gal of water per hole is used. Drill bits average 14 holes before they become dull and can be resharpened 15 or 16 times.

Some difficulties were encountered in the beginning, the most serious being the tendency of the cuttings to form a mud which would stick the drill stem in the hole. This was overcome by using bits which had grooves in the side to carry the water down and out of the hole and by reducing the drill speed from the original 700 rpm.

Coal is produced on two shifts, but the roof drill is operated on all three. The drill usually gets behind by the end of the second shift, and the third shift is spent in catching up, putting in extra bolts where the slate or top coal has broken around a bolt, tightening old bolts and similar work. The third shift also loads the trailer with water and bolts, greases the machine and gets everything ready for the next day. There are six men each day on the drill and the equivalent of one man setting props for the two producing shifts, or a total of seven men. These replace an average of 12 timbermen. In February the bolted section averaged 982 tons of washed coal per day, with an average of 213 bolts per day or 4½ tons per bolt.

In this mine we also have a producing section with identical equipment and conditions where the roof is supported with conventional timbering. In February, 1952, the labor cost in the timbered section was 6 cents higher than in the bolted section, but the timber cost was 15.4 cents as compared to a cost of 24.9 cents for bolts, drill bits, drill parts and props in the bolted section. This made a cost differential of 3½ cents in favor of the timbered section. However, the daily tonnage in the timbered section was 34 tons higher than the bolted section and on an equal tonnage basis the differential would have been only 0.6 cents per ton in favor of timbering.

Since starting to bolt there have been two reported injuries with 2½ hr lost time on the drill and none by falls of roof in the bolted area. In the corresponding period, the timbered section had 17 reported injuries from timbering or falls of roof, of which two were lost-time with a total of 42 days lost.

## Roof Bolting In Pillar Recovery

**By JAMES L. GILLEY**
*Mining Engineer*
**U. S. Bureau of Mines, Welch, W. Va.**

IT is an exaggeration to claim that roof bolting is, or will become a panacea for all roof-control problems. Because of the uniqueness and wide range of application of the method, it is perhaps the most generally promising remedy yet devised. However, more than 20 experiments in pillar extraction with roof bolts, with which the speaker is familiar, indicate the range and value of the method.

It seems that the roof-bolting method of support is the nearest answer to the problem; however, the method is not applicable under all conditions and therefore is not recommended in all cases. From the start, good results were obtained but the generally higher initial costs of materials and equipment made excellent results imperative. Several operators in scattered parts of the United States have experimented with roof bolting in pillar recovery, but in southern West Virginia in particular, where the method is used in mines operated in at least six different coal beds with variable roof structures, the experimental stage has been passed, and the practicability of the method proved over a period of three years.

In many localities full efficiency from the roof-bolting method has not been obtained and there is ample scope for improvement—for instance, in longwall mining with roof bolts.

There are certain salient factors that should be remembered in starting pillar recovery with roof bolts. Good workmanship in installation and placement of bolts of proper type and dimensions is of primary importance. Pillaring with roof bolts should not be attempted without preliminary experimentation and advice. Early application of support by roof bolting minimizes movement of the roof strata, within the immediate working area (the most dangerous zone) and roadways within the front abutment area.

If the full benefit of roof bolting is to be gained with the least amount of trouble, complete extraction should be sought to ensure clean, successive roof falls over small areas close to line of extraction. This tends to minimize large cantilevering areas and probable shifting of stresses. Ample temporary support is essential during roof-bolting operations as well as during loading operations at the working faces. Roof bolts alone without enough breaker posts cannot be used successfully and with safety in extraction of pillars by the open-end method.

## Overall Economies of Roof Bolting

**By D. B. SHUPE**
*Superintendent*
**Eastern Gas & Fuel Associates**

ALTHOUGH almost all of the 20 mines in our company are today using bolting to some degree, in the preparation of this paper I have selected two mines at which the most discernible progress has been made. An attempt is made to emphasize mining problems at these operations where roof bolting contributed improvement and to summarize the most important advantages realized.

### Bolting at Mine "A"

Mine "A" is a shaft operation in the Pocahontas No. 3 seam. Most of the difficulty encountered in direct face production stemmed from the immediate roof. Averaging five ft in thickness, this seam is overlain with a heavy unconsolidated shale perhaps best described as "rotten." Ranging from 10 to 22 in. thick, this drawslate is characterized by its many planes of weakness, kettlebottoms, slickenslides, and plates, and by its almost total inability to stand unless well supported, for more than a few minutes.

Roof bolting was no stranger in this operation. Earlier officials had installed one-in. bolts using large specially-made expansion shells about 11 years before. As a matter of interest, these rods have now stood for 14 years and showed no deterioration of consequence in that time.

Bolting along usual dimensional patterns and using conventional pneumatic equipment for drilling and installation was begun in the face cycles after observation of two experimental installations for several months. Four-ft wedge type bolts were used at first with square plates but later with two-in. by 12-ft wood headers where drawslate tended to drop out between sets. Where immediate roof was slated in development, only plates are used. Sectional conditions showed an immediate improvement, both as to roof control, clearances, both lateral and vertical, cleanliness, safety, production, and cost. Production on the first section bolted rose over 50 percent with an accompanying decrease in face labor costs of 39 cents per ton.

This saving alone was sufficient to offset the increased cost of bolting material over wood. An analysis covering an eight-month period after bolting was introduced on four sections, one of which was pillaring, showed an average gain of 36 percent in tonnage produced with an increase in efficiency of two tons per man shift. Face labor cost improvement averaged 40 cents per ton while roof bolting materials added only 23 cents per ton to timbering costs.

Where on the first bolted section 637 cars of rock were loaded due to slating in every place, in the two and one-half months prior to bolting, only 20 cars were loaded in the two months afterward. Where over 30 cars of material was required for driving 1000 ft of single entry, only three cars are now needed. The many other "fringe" benefits are too numerous to mention.

### Bolting at Mine "B"

In Mine "B" in the Pocahontas No. 4 seam, roof bolting was introduced in sheer desperation to find some means of controlling unusual roof pressures. Every method of support thought practical had been tried. Several timbering installations, especially the tunnel arches, cost up to $26 per lineal foot. In another case, where 16 ft of bottom rock was taken up in grading, timber sets carried up to the roof cost over $15 per foot.

Initial bolting was confined to haulage entries and airways already driven, and was gradually extended to become part of the face cycle. Various materials were used, but finally wedge-type bolts 30 in., 36 in. and 80 in. long were used with either plates or 4-in. channels as the conditions required. Benefits were quickly apparent and bolting has been extended to most parts of the mine. In a heavily graded haulway roof bolting before grading reduced the support cost from $15 per ft to $9.20 per ft. In another grade job, support costs were decreased from $9.45 per ft to $6.15 per ft. This introduces an interesting fact, that regardless of height of opening, roof support costs the same when bolts are used. With timber, cost increases with height.

Unlike many operations where bolting has replaced timbering in whole or in part, the total roof support cost at this mine has trended downward since beginning with bolts. Although some variation has been experienced, a 17-month average indicates a cost reduction of about 8 cents per ton.

In both cases economies realized entirely offset the added cost of bolting over timbering. At the same time, improved mining conditions and underground safety have improved without added cost. Although experience has been most encouraging, management feels that bolting is the cure for all roof control problems, but rather that, in unusual cases, bolts supplemented by conventional timber can do the job.

## Economies of Roof Bolting

By JOHN A. STACHURA
*General Superintendent*
Enoco Collieries, Inc.

ENOCO Mine of Enoco Collieries, Inc., near Vincennes, Ind., produces coal from the Indiana No. 5 seam. The coal is 4½ to 8 ft thick, averaging 6 ft. Daily average production is 6200 tons.

A black slate roof 54 in. thick extends over 60 to 70 percent of the mine. Above this is about 24 in. of limestone, normally very good roof.

In the southwest section of the mine the roof changes to gray or brown shale often without the limestone. This is very soft and hard to hold with conventional timbering.

Use of bolts for roof support was begun two years ago in an area where six-in. H beams failed to support the slate. Then bolting was tried at loading ramps. Results were satisfactory. Next entries being cleared up for additional working territories were bolted with five-ft bolts on four-ft centers replacing six by six-in. by 14-ft wood bars on three-ft centers. Entries bolted two years ago are still free from falls and in as good condition now as then. Original installations cost more than conventional timbering but proved roof bolting could be successful in Enoco Mine.

There are now four units using roof bolts in the regular operational cycle. About 90 percent of bolts used are five ft by ¾ in. with rolled threads. Where limestone is found above black slate some three- and four-ft bolts are used. Also some 8000 five-ft by one in. wedge type bolts have been installed.

Bolts are installed at the rate of 275 per shift, 550 per day. To date about 102,000 bolts have been installed in 75,000 lineal ft of main entries, room entries, of room territories and breakthroughs.

In two comparable units, supplies for conventional timbering in one cost $0.3591 per ton while in the other panel which was roof bolted, the unit supply cost was $0.3833 per ton. However, the conventionally timbered panel required 10 more shifts to work out the room territory. This pushed the labor cost $0.10 per ton higher than in the roof bolted panel leaving a net cost advantage of $0.0758 in favor of roof bolting.

Another unit cost study for two units working under similar conditions for a five-day week, again showed a savings in labor and supplies for roof bolting over timbering. The savings amounted to $0.025 per ton.

In entries where steel bars are normally used for support great savings were realized. Four bolts complete cost $4.36, while a 20-ft steel collar bar costs $20 and savings range up to 69 or 70 percent.

In addition to improvements in roof bolting techniques and equipment which permitted maintaining an average of 101 bolts installed per shift for 75 shifts (maximum was 187) there are numerous other advantages which improved overall efficiency and safety.

Cost of handling supplies at Enoco was 24 percent lower in 1951 than in 1950.

Increased mobility of all equipment is a result of greater clearance.

In 26 months there has not been one lost time accident due to a roof fall in bolted sections.

Coal recovery in bad top areas increased 5 percent without increasing room widths.

Bolting permitted continued use of high equipment even where coal height varied considerably.

Roof bolting eliminates stray wood in the cleaning plant.

# STRIP MINING

## Overburden Blasting Techniques

By JOHN L. ROMIG
*Assistant Manager, Tech. Div., Explosives Dept.*
Atlas Powder Co.

THROUGH the use of the so-called machine-gun type camera it is possible to "stop" blasting action at regular timed intervals during the blast for detailed study and interpretation. Three important conclusions which may be drawn from the visual evidence of the camera and which may be at odds with some older theories are:

(1) A column of explosives does not detonate instantaneously
(2) The point of initiation of a charge of explosives is important

(3) The proper use of milli-second delays can do far more than previously supposed to gain increased blasting efficiency and properly break the overburden.

Study of photographs gives visual evidence that the movement of rock or overburden definitely corresponds to the wave of detonation along the bore hole. Having determined that a column of explosives does not detonate instantaneously it becomes obvious that the point where the explosion is initiated is of major importance. Explosive forces follow the lines of least resistance, and these lines are established at the first instant of detonation, setting the pattern for the release of force as the wave of detonation proceeds along the explosives column.

In strip mining, following the practice of vertical hole drilling, there is usually a marked difference in appearance of blasts when the comparison is based on top versus bottom initiation of the charge. In most instances, bottom initiation affords better confinement of the explosives force and thus gives the explosive more opportunity to work in displacing and breaking the overburden. Naturally, with confinement of the explosives gases, the air blast or air vibration caused by these gases is generally lessened.

Improvements in the techniques of using milli-seconds delays in overburden blasting are developing steadily. As a result the trend today shows startling increases in the practical application of this modern method of detonating explosives force. But full utilization of this method or any other improved methods will depend on how much attention and study is given to their proper application. An active interest in blasting techniques and results is important and should be followed closely.

It has been definitely established that, properly applied, milli-second delays can provide the following advantages:

(1) Better fragmentation. This not only means faster digging but also less wear and tear on equipment.
(2) Improved displacement. It is not uncommon to get reasonably good fracture and not have sufficient displacement. This lack of displacement may result in slower digging.
(3) Reduced vibration and noise. This has been documented by seismograph tests and is equally true of either progressive or alternate methods of milli-second-delay shooting.
(4) Controlled throw. Both the extent and direction of throw can be influenced by the delay periods used.
(5) Reduced backbreak. Reduction of backbreak in vertical hole shooting permits starting the next row of holes right where they are needed.

## Progress In Rotary Drilling

By J. S. HARMON
*General Superintendent*
Hanna Coal Co.

IN stripping the Pittsburgh No. 8 seam in eastern Ohio, the formation offering the greatest resistance to fracture is a massive limestone averaging 20 ft thick. The topography of the area is fairly uniform, but there is enough variation in elevation and vegetation to require the use of a bulldozer to clear brush and create drill roads. Approximate average slope of the terrain is about 15 percent.

Hanna converted from horizontal to vertical drilling during the past year and now has six rotary, air-cleaning, vertical drills. Conditions that led to the selection of the new system were:

(1) Greater overburden depth demanded that vertical drilling be employed. Excessively thick overburden could not be prepared satisfactorily with sidewall drilling.
(2) A desire for better fragmentation.
(3) To reduce concussion and blast propagation waves created by the firing of horizontal holes.

Studies are incomplete, but some results from the change in preparation of overburden are evident:

(1) The preparation of thick overburden for stripping shovels is more easily accomplished by placing explosives where formations offer greatest resistance.
(2) Greater fragmentation has been achieved.
(3) Disturbances created by the audible sounds of blasting, concussion and blast propagation waves have been eliminated.
(4) Eliminated congestion in the pit created by the sidewall drill.
(5) Speed of drilling increased over the sidewall drill, on a footage drilled per shift basis.
(6) Stripping shovel performance records show a greater percentage of operating time, and cubic yards handled per operating hour due to better overburden preparation.

Considerable experimentation is being done as to bit sizes and types. The present trend is to use an 8½-in. bit allowing the use of a larger size explosive with greater concentration of explosives in stratum desired for more efficient overburden fracture. The increase in bit size from 7⅞ in. to 8½ in. has in no way impaired the ability of the machine to give satisfactory performance.

A bit cost of approximately $0.028 per foot is being obtained with a Hughes hard rock bit that averages 5000 ft of life. Since rotary drilling began, monthly footage figures have continued to rise. For December, 1951, the average of four drills was six holes per drill shift with an average hole depth of 56.25 or 336 ft per drill per 7¼ hr shift. Men employed in drilling assist in the loading of the holes and shooting of the overburden. It is necessary to remove 1,100,000 cu yd of overburden each month to maintain production.

The increased speed of vertical rotary drilling with air cleaning of the holes has made available many acres of stripping lands formerly classified as unprofitable.

## Road Construction and Maintenance

By S. F. SHERWOOD
*General Manager*
Central Indiana Coal Co.

MR. SHERWOOD'S paper will be published in the August issue of MINING CONGRESS JOURNAL.

## Rotary Drilling in the Anthracite Region

By C. TALHURST BUTLER
Central Pennsylvania Quarry Stripping & Construction Co.

FIRST introduced in the Eastern Middle Field of the Anthracite Region of Pennsylvania in October 1951, the drilling of blast holes in open pit coal mines by rotary drilling machinery is rapidly extending to the major areas of the region. During the first four months of 1952, new machines were being placed in operation at the rate of one per month in the Northern and Southern Fields.

Although the rotary drills in the anthracite region have been in operation for only six months, greatly differing conditions are being met on individual jobs. As an

example, the footage obtained with the Hughes Tri-Cone Bit averages 190 ft on an Eastern Middle Field operation, whereas in the Northern Field an average of nearly 3000 ft has been attained. Similarly, in drilling a 7⅞ in. diam hole with a rotary drill of the same manufacture, production varies from 50 to 400 ft per seven hr shift.

Under rather rigorous conditions where the rock was characterized by strata of hard, abrasive sandstone with some banding of conglomerate, the whole formation being broken as the result of previous mining in the coal vein, a Joy Heavyweight Champion Rotary Drill was used to drill in the same areas for a 30-ft bench cut as were churn drills making nine-in. diam holes.

Not yet in regular operation in the anthracite region, but demonstrated for several days during April 1952 was the adaptation by Ingersoll-Rand of their air motor to the turning of the stem on the Quarrymaster Drill. Using a 6¼-in. diam Hughes bit and a stem rotation rate of 75 rpm, a year old machine produced 50 percent footage in a shift than did a new machine equipped with the standard, reciprocating type drive. The rock drilled on this test was comparatively soft by anthracite standards and the over-all time of the demonstration was too short to accept these results as conclusive. The test did indicate a decided advantage for rotary drilling.

Another interesting IR development is the Vapasoi Dust Control system by means of which the exhaust air is substantially freed of dust. Water is fed into the air, which is exhausted at the drill bit, at a rate sufficient to collect the dust particles on small chips of rock that are ejected. Yet the moisture control is such that the chips are ejected as easily as they would be if completely dry.

Although rotary drilling is just starting in the anthracite region, it is already apparent that there are several advantages of this method compared with churn drilling, especially where only two or three churn drills are required for an operation and where the rock is soft or of the moderate hardness.

## Stripping Deep Overburden In the Midwest Bituminous Field

By ARTHUR F. LEE
*District Engineer*
Truax-Traer Coal Co.

THERE are many mines in the bituminous fields that are successfully and economically stripping overburden 50 to 90 ft in depth. Various types of equipment are used and various pit layouts and methods of excavating and spoiling are employed to meet the different classes of strata and geological formations that are encountered.

The tandem method in which both stripping shovel and stripping dragline is located on the coal is familiar. Combination units, shovel and dragline on spoil are operated by the Enos Coal Mining Co. in Pike County, Ind. Stripping operations consist of two independent pits, each pit containing an electric shovel with a 36 cu yd dipper to strip the overburden. Surplus overburden is rehandled by a dragline with a 6 cu yd bucket. Coal is loaded retreating, so as not to interfere with the shovel operation.

A dragline only, handling shale and rock, is operated by the Maumee Collieries Co. at their Chieftan Mine No. 20 in Vigo County, Ind.

The mine consists of two stripping operations with an electric dragline in one pit and a shovel in the other. The shovel is aided by a dragline working only two shifts, with its companion dragline working three shifts.

The average depth of stripping in the first pit for the last few months was about 75 ft; a ratio of 16.3 cu yd to 1 ton of solid coal, or 19.7 cu yd to 1 ton of washed recoverable coal. Average monthly yardage was about 800,000, the maximum being 900,000 cu yd. A dragline only, handling soft overburden that requires no shooting, is operated by Fairview Collieries Corp. at their Harmatten Mine in Vermilon County, Ill. The tract is being worked with an electric coal-loading 7½-cu yd shovel, and two electric draglines; one with a 25-cu yd dipper, the other with a 30-cu yd dipper.

Each of the two draglines are handling about the same amount of yardage per month, this varying from 500,000 to the record of 700,000 cu yd of virgin overburden, which does not include the "V" cut or rehandled spoil. This rehandled dirt averages about an estimated 15 percent and would be added to previous figures for actual yardage moved.

A shovel alone is operated by Hanna Coal Co. at its Georgetown Mine No. 12 in Harrison County, Ohio. Three electric shovels use a 45- cu yd dipper and one a 50-cu yd dipper. The property is mined by contour stripping. The shovel opens the pit on or near the crop line, depending upon quality of coal, beginning at one of the valleys; stripping back and forth, following in general the directions of the surface contours, thereby maintaining an outside curve for the spoil. Stripping limit depth is planned about 85 ft, however greater depths are sometimes made in crossing the ridge. The pit is maintained at an average width of 90 ft, 45 ft being for coal berm and 45 ft for the coal loader.

Combined yardage of excavation for the four large stripping shovels last year was 49,081,000 cu yd or an average of 1,100,000 cu yd per shovel per month. The maximum for one shovel in one month was 1,505,000 cu yd.

## Deep Mine Stripping in the Anthracite Field

By PAUL GODDARD
*Vice-President*
Carey, Baxter & Kennedy

MR. GODDARD'S paper appeared in the April issue of MINING CONGRESS JOURNAL.

## Stripped Land Rehabilitation

By FRANK J. FORESMAN
*Personnel Director*
The Pittsburg & Midway Coal Mining Co.

PITTSBURG & Midway Coal Mining Co. has been following a program for the utilization and development of land acquired through strip mining of coal for many years. Experience and knowledge has been gained along two lines: (1) improving and administering tracts of farm land that lie adjacent to mining operations but do not contain workable coal; and (2) utilization and development of the mined land through a long-range and carefully planned rehabilitation program.

The first rehabilitation work undertaken was the planting of trees in 1938. With very few exceptions the plantings have proven successful. Survival has been good, and the rate of growth has been above normal for the district.

Originally before seeding, it was considered good practice to let the strip bank lie fallow for two to three years to let some natural erosion and levelling take place. Today, as a result of experimentation and study, the strip banks are seeded as soon as possible after mining operations are completed, with some seeding being done almost in the shadow of the excavating shovel.

Experimental work to determine the adaptability of the

strip banks for forage crops was undertaken in 1945. Results were so good that all stripped company land is being rehabilitated through development of strip banks as pasture land. No mineral supplements except salt and iodine are required, probably due to the trace minerals that are made available to the forage plants when the ground is disturbed. Experience has shown that the cattle will consistently graze strip land pasture in preference to flat land pasture when both are available. Compared on an equal basis, the carrying capacity of strip land pasture will equal or slightly exceed the district's average for flat land pasture of four to five acres per animal unit.

An adequate water supply is no problem in the areas rehabilitated for strip land pasture. Final cuts made in mining operations and low valleys between many of the strip banks provide reservoirs of water that are kept filled and fresh by surface drainage and underground seepage. Water reservoirs, or strip land lakes varying in size from a fraction of an acre to 10 or more, also provide excellent fishing, boating and picnicking facilities. With few exceptions the entire area is open to the public.

As a result of the experence gained from a variety of rehabilitation projects the conclusion has been reached that rehabilitation work of any kind requires careful planning. The strip land area must be carefully studied to determine the use for which it is best adapted. Determining factors are soil classification of the strip banks, physical characteristics, local land use, climatic conditions and economic considerations.

Before any work is done, the soil should be checked to determine the alkalinity or acidity. The strip bank characteristics such as topography, mechanical and chemical conditions of bank material, and the chemical condition of impounded and run-off water should be studied. Use of the land in the locality where rehabilitation work is to be undertaken should be used as a guide in determining for which use the strip land is best adapted. Climatic conditions have an important bearing on the crops that can be grown, and selections must be made that are adaptable to the local climate.

Although there is still much to be learned about strip land rehabilitation, results have shown that considerable progress has been made and the company is looking and planning ahead with enthusiasm, confident that through proper use strip land can be an asset to the community's agricultural economy.

# NEW DEVELOPMENTS

## Breaking Coal At Face With Chemechol

By R. D. HEDREEN
*Assistant Manager of Chicago Sales Office*
E. I. du Pont de Nemours and Co., Inc.

THE du Pont Co. has conducted a comprehensive research program directed toward new and better products for breaking down coal. As a result, a non-explosive device called CHEMECHOL has been developed and extensive trials have been conducted during the past year.

After combining studies of many coal breaking methods the conclusion was reached that an ideal method of breaking down coal should incorporate the following: the medium should be non-explosive in all respects, and eliminate the use of squibs or blasting caps; the reaction should not emit a spark or a flame; the gaseous products of the reaction must be non-noxious; the method should be economical and convenient; and must meet the legal requirements of certain states for on-shift use.

This newly developed method breaks down coal from the mine face by the force of compressed gas generated by chemical reaction within a steel tube and released through a rupture disc. There are three main components to the device: (1) the Chemechol unit itself, which is decomposed to furnish the gaseous products which do the work, (2) the steel tube in which the reaction takes place, (3) the battery controller by means of which the chemical reaction is started.

The steel tube is approximately 54 in. long and 2 3/16 in. in diameter. Over-all length of the assembly, less electrical cord, is about five ft and the total weight is about 35 lb. Discs shear at a pressure of 18,000 to 22,000 psi. The gaseous products produced when a unit is discharged consist of approximately 50 percent steam, the remainder being substantially nitrogen and carbon dioxide.

Most experience with Chemechol to date has been in the Lida B Mine of the Franklin County Coal Corp. where Chemechol has been used since March, 1951. It has continued there on an expanding basis so that at year end all of the coal produced was being broken with this method. During the period up to January 1, 1952, this amounted to 188,000 tons. Coal at the Lida B mine is undercut and some of the places are sheared as well. The coal produced has been of uniformly excellent quality and in percentage of coarse coal and minimum quantity of fines has been appreciably superior to that produced with permissible explosives. Loadability has been excellent. The number of holes required per place has been equivalent to those needed for permissible explosives. From five to six and a half tons of coal are produced per discharge, depending upon the width of the place.

From experience to date, in undercut coal, it seems probable that one unit will replace from 1½ to 2 lb of permissible explosives. This would include, of course, the replacement of one electric blasting cap necessary with the permissibles. It is still too early to make an accurate forecast.

## The Samson Stripper

By RICHARD TODHUNTER, JR.
*General Manager*
Barnes & Tucker Co.

THE mechanization of longwall faces, both in Britain and on the continent of Europe, is developing on the "free front" system, in which a conveyor is kept close to the coal face and is advanced by power without being dismantled after a relatively small slice of coal is removed and loaded mechanically from the face. Setting of roof supports follows behind the conveyor and thus a sequence of operations replaces the previous cyclic system with one shift picking up where the last left off.

The face is top-cut and the Samson Stripper removes about a two-ft slice of coal from the face and loads it onto a special shaking conveyor alongside, both being between the front line of roof supports and coal face. As the face is stripped, the conveyor is "snaked" over behind the stripper and a new line of supports is set. On arrival at the end of the face, the stripper is advanced and is then ready to travel back again in the opposite direction. As the machine is double headed, it is not turned at the end of the face.

For the first trial, at Barnesboro, it was decided to adapt a longwall system to extract the complete 300-ft pillar with a retreating longwall face. A retreating system was selected because packs would not be required to support the entries. The entries provide areas for the advancement of the stripper at each end of the face.

The immediate roof is supported by Dowty hydraulic props. They have 10 in. adjustment and can easily be set by one man. Each prop is set at an initial load of five tons, and yields at a load of 20 tons, which is maintained as the prop yields. A hook on a long handle is engaged in a "D" link near the top of the prop and a slight pull opens a relief valve allowing the prop to be withdrawn with ease and safety. The props are set with a small wood lid at the top and are on four-ft centers along the face. One is also set between the chocks on the waste line. Two men can release, advance and reset 30 chocks and also draw off the Dowty props from the waste edge in one shift.

After the stripper started work October, 1951, it was found that the width of strip which could be efficiently removed was limited to about 15 in. The lack of a parting at the roof and the soft center of the seam did not permit any outward movement. The blades on the stripper penetrated the coal without shearing it until a point was reached where the coal became crushed. The size of the leading blade was increased. This improved performance but still permitted only 18 to 20 in. per strip. Thus only 48 tons were produced for one strip. It was decided that a precut at roof level would greatly improve the rate of production. A longwall coalcutter was ordered. The cutter bar is mounted on a hydraulic turret which has 8 in. vertical adjustment to follow the roof as the machine cuts. The cutter bar is at right angles to the body of the machine, which is mounted on top of the face conveyor, which acts as a guide along which it travels.

As soon as the coalcutter was put to work at the beginning of February, 1952 it was apparent that the stripper was now capable of production.

The width of strip now being removed averages 30 in., giving 110 tons per strip. When stripping, the machine travels at an average rate of three fpm, and produces 70 tph. So far, only two strips per shift have been achieved. On a 270-ft face, the proportion of the shift spent at each end is excessive and it is believed that a face at least twice this long is desirable and is being prepared. No extra men will be required, and at least 1½ strips on this length of face should be obtained, giving an output of 275 tons per shift, or 25 tons per man against the present 15 tons.

The size of coal is very large for this seam, with lumps as big as two by two by one ft, but there is some degradation by the time the coal is loaded into the mine car. The percentage of ½ in. by 0 is 49.54 percent, a reduction of 10 percent for the continuous mining room and pillar system. Very little bony or floor is taken by the machine, so the product is relatively clean. Because very little dust is produced, water sprays are not used.

Roof control has been satisfactory, but there have been occasional small breaks along the face. Harder chock wood, attention to the tight setting of the chocks, and keeping them well up, avoids this trouble.

It is considered that a satisfactory system of continuous longwall mining with excellent roof control has been established in the "B" Seam. It is confidently expected results will be greatly improved once a longer face is established. Successful operation in the difficult "B" Seam indicates that there are many seams where it can be applied more easily.

## Meco-Moore Longwall Machine

**By A. B. CRICHTON, JR.**
*Vice-President*
**Johnstown Coal and Coke Co.**

MR. CRICHTON'S paper is in process of revision to include all the latest operating data, and will appear in full in *Coal Mine Modernization, 1952.*

## Experiment With a German Coal Planer On a Longwall Face

**By WILBUR A. HALEY**
*Mining Engineer, Coal Branch, Fuels and Explosives Division*
**U. S. Bureau of Mines**

THE Federal Bureau of Mines, through the Bituminous Coal-Mining Section has entered into a cooperative agreement with an American coal company and a German manufacturer of a new-type coal planer. The purpose of this agreement is to conduct an experiment to determine whether this type of mining equipment and the longwall mining system are adaptable to some of the thinner American coal beds.

A coal mine, operated in the Pocahontas No. 4 coal bed in southern West Virginia, was chosen for the site of the experiment because the physical conditions at this mine were believed to be most suitable. The coal bed is nearly flat-lying; the thickness ranges from 31 to 36 in. The cover in the experimental area ranges from less than 100 ft to about 300 ft. The complete planer unit was installed along the coal face in November, 1951. Actual mining was begun during the last week of that month and has continued one shift per day and five days a week since that time.

A block of coal, 328 ft wide and 1750 ft long was developed by driving two parallel sets of three entries and connecting the sets of entries with two parallel rooms at the inby end. The long face will be retreated a distance of 1460 ft and about 11 acres of coal will be mined from the panel. The bulk of the fresh air passes through two aircourse entries adjacent to the belt entry of the panel and is directed along the face and into the bleeder-entry return airways.

Mining is accomplished with a planer. This consists of a series of cutting knives set in a heavy frame which slices the coal from the face as it is pulled along the face by a heavy chain. The planer has a speed of 75 fpm and travels in both directions. Coal falls onto a conveyor set close to the face and along its entire length. The face conveyor is the double-chain and flight type and will travel at the rate of 150 fpm toward the main drive. Conveyor pans are connected with flexible couplings, which permit operation along an uneven coal face as well as on an uneven mine floor. Lights used for both face lighting and signaling are spaced at 20-ft intervals. Original plans called for rows of steel jacks perpendicular to the face 2½ ft apart and jacks in individual rows 39 in. apart. Later about ¼ of the rows of jacks were replaced by wood cribs 8 to 12 ft apart. Jacks from inby row and the cribs are recovered and reset near the conveyor as mining progresses. Wood cribs also are used for roof support inby each drive unit; aluminum jacks and wood props are used in the entry outby the main drive.

Face jacks are mechanical and will yield a maximum distance of 2½ in. when under a load of 40 metric tons. After complete yielding the jacks will support a direct load of more than 90 metric tons before failing. I-beam caps of adjacent sets are hooked together to form continuous beams perpendicular to the face. A steel shoe is provided to hold a newly connected I-beam in place until mining progresses sufficiently to permit a jack to be set under the steel cap. In this way, the conveyor is temporarily protected from small roof falls.

Coal is discharged from the planer or face conveyor into a standard American chain conveyor in the belt-haulage entry. The chain conveyor feeds a 30-in. panel belt conveyor, which in turn discharges the coal into mine cars.

This experiment has been in operation for several months and all the problems incident to long-face mining with this type of equipment have not been solved. However, the results to date are encouraging and the work has

shown that the planer will cut this friable coal with overall satisfactory performance and reasonably good productivity from the unit.

## The Dosco Continuous Miner

By LOUIS FROST
*Chief Mining Engineer*
Dominion Steel and Coal Corp., Ltd.

THE collieries of the Dominion Steel and Coal Corp. are located in Nova Scotia and produce about 25,000 tons of coal per day. Of this 70 percent comes from longwalls.

Nearly all of the coal seams are under the Atlantic Ocean as much as 2500 ft and pitch seaward at gradients of from 10 to 50 percent to the horizontal. Longwalls are laid off parallel to the pitch of the seam at the most suitable angle across the cleavages in the coal and roof. They advance or retreat across the strike of the seam.

Roof conditions require very close support and this constitutes a problem of supreme importance in the design and application of mechanical loading equipment.

European machines were eliminated after study because their use would mean a drastic change of the roof support methods established over many years.

About this time attention was called to the "Silver" Continuous Miner in operation at the Consolidated Coal & Coke Co. near Denver. While this machine was not suitable for longwall operations, it could be redesigned for such purpose. Accordingly, the engineering staff of the Dominion Coal Corp. developed the DOSCO Mark I Continuous Miner. This machine was designed to fulfill the following requirements:

The cutting head has to be 4 ft 6 in. wide to produce 500 tons per operating shift from a 500-ft face in one pass and be ready to travel back for another cut at start of next shift. The machine would have to be extremely maneuverable and able to negotiate 10 to 50 percent grades. Size and shape had to allow its use with existing roof support methods. All electrical equipment had to be certified permissible.

As designed the DOSCO Mark I Continuous Miner was characterized by a number of cutting chains mounted in a vertical plane running side by side. The machine was 18 ft 4 in. long and 4 ft 6 in. wide. Provision was also made to raise or lower the cutter chains hydraulically through a full height of 7 ft. The whole machine was carried on hydraulically operated crawlers 10 in. wide and could be advanced at a speed of 24 ft a minute. The driving units consisted of two 550-v, 3-phase, 60-cycle, totally enclosed water cooled motors rated at 75 hp to drive the chains and one similar motor rated at 30 hp to drive the conveyors and hydraulic pump.

During the mining cycle of from 31 to 47 seconds, actual producing time was from 14 to 23 seconds. The shaker conveyors running along the face were inadequate and could not take the coal away from the machine. As a result a 30-in. flat face belt running at 350 fpm was installed capable of handling the peak output.

The machine worked well but had a number of inherent weaknesses which were rectified in the DOSCO Continuous Miner Mark II.

The new machine has better balance and maneuverability and is shorter, 16 ft 6 in. long.

By bringing the chains closer together at the inner end of the cutting head, spillage from the outer chains is eliminated. The new jib is 4 ft 9 in. wide at the front end, carries seven chains with picks arranged two-in. apart between cutting lines. Picks are tipped with tungsten carbide and have a 20 deg forward cutting angle. A rubber conveyor has replaced the original chain conveyor and is capable of variable speeds up to 300 fpm.

Specially designed spray nozzles, mounted on the sides of the cutting head provide a mist curtain to allay dust. Water mixed with a wetting agent is supplied to these nozzles at a pressure of 200 psi.

The DOSCO is rapidly proving its worth and replacing the orthodox system of longwall operation as rapidly as crews can be trained. It is planned over the period of the next five years to install these machines in all longwall operations. This will require a total of 75 machines including those idle for overhaul.

## Auger Mining Underground

By A. J. OPPERMANN
*Consulting Engineer*
Uniontown, Pa.

A new concept of underground mining has formed in the past several years. Mining men for years have toyed with the idea of circular openings because of better roof control, improved ventilation characteristics. However, the cost of such an opening has forbidden its use on a large scale, and the method of mining by boring machines was, more or less, relegated to a back seat.

Augers should be used in conjunction with conventional mining equipment on the retreat after the area is developed by conventional methods. Augers used in so-called "production mining" should return an ultimate recovery of coal over the entire boundary of somewhere between 75 percent and 80 percent without any thought given to complete pillar extraction.

Questions confronting mining men in the successful operation of auger machines in the underground removal of coal are given below, listed in their order of importance:

(1) Will it provide a maximum recovery of coal?
(2) What is the proper size auger for the seam?
(3) Is the cutter and breaking head design correct?
(4) What is the proper length of auger section?

Even though auger equipment has been designed there has not yet been enough underground use of these machines to warrant full acceptance as they are now constructed. They are still in the embryo stage. However, all other types of underground mining equipment faced equal odds. Most of them finally won over what first seemed to be insurmountable obstacles and are doing a good job today. Manufacturers of mining equipment can go far in perfecting their designs if they fully acquaint themselves with the facts needed for a successful unit; one that can do the job, and stay on the job with a minimum of mechanical failure.

# UNDERGROUND HAULAGE

## Slope Sinking at Peabody No. 10 Mine

By LYLE MORRIS
*Division Engineer*
Peabody Coal Co.

MR. MORRIS' paper appears in full in this issue, beginning on page 33.

# Gathering and Service Haulage With Track and Mine Cars

By B. M. NEEL
*Assistant General Superintendent*
Stonega Coke and Coal Co.

GATHERING and service haulage at this mine was not chosen for description because of any outstanding production records or any unique plan or arrangement which might be of particular interest to mining men. Actually, the selection was made because of the consistently good job of gathering haulage being done day after day and month after month under extremely adverse road conditions.

Loading operations are by both mobile loading machines and hand loaders. The mine is worked two shifts daily with five mobile loading units and an average of 70 hand-loaders on each of two shifts. Production averages approximately 3000 tpd. Six-ton cable reel locomotives are used for all gathering haulage, and approximately 550 composite mine cars of 3.15 tons capacity are maintained in service.

A conventional room and pillar system is followed for both mobile loaders and hand loaders, with room entries on 350-ft centers. All mainline track is of 85-lb rail on 6 by 8 in. wood ties. Standard side tracks, empty and loaded chutes are of 45-lb steel on 6 by 6 in. wood ties. Room entry track is of 25-lb steel on 4 by 4 in. wood ties with steel ties being used only in the rooms and near the faces of advancing headings. Track gauge is 44 in. with No. 2 cast iron frogs for room turnouts.

On a typical hand loading section, a gathering locomotive serves from nine to 14 hand loaders—depending on the track grades on the different sections. It has been found that the number of cars that can be delivered to and from the working faces varies in direct proportion to the grades and the hand loaders must be supplied with enough cars to maintain the mine average of four cars per loader per shift. The routine in placing empties and pulling loads is typical and familiar to everyone with this type of mining experience.

When practical, not less than five faces, either rooms or pillars, are provided for each mechanical loading unit. Cars are supplied to the loading machine in the usual manner.

The extremely heavy grades in this area have, in some instances, made it necessary for the mobile units to do selective mining, due to their inability to negotiate the grades and to load at the face without sliding away from it. In fact, it has been possible to mine some of this territory only because of engineering ingenuity, development of unusual skill by gathering motor crews and the meticulous use of shop made skids and car holding devices.

# Dispatching, Block Signals and Telephone Communications In Underground Track Haulage

By WALTER R. KIRKWOOD
*Chief Inspector, Coal Mines*
Tennessee Coal and Iron Division, U. S. Steel Co.

THE trend within the last few years to speed up haulage has been accomplished by the development of safer haulage equipment and practices. By the use of improved communications, better coordination and dispatching has been made possible.

Trolley phones are the latest contribution to underground communication and they are extremely useful in improving any dispatching system. The installation of 12 of these phones was completed at one of the mines of Tennessee Coal and Iron in July, 1950. Three units were installed on main line locomotives, three on swing locomotives, four on gathering locomotives, one on a material or general service locomotive and one in the dispatcher's office near the underground dump.

All units are on a "party line" system allowing all concerned to know what is going on at all times. The dispatcher, the key to any dispatching system, is able to direct the overall movement of traffic and keep cars coming and going.

Trolley phones provide a safety feature as well as one of efficiency. When a locomotive is approaching a sidetrack with either loads or empties, motormen know or can very easily find out by asking, while in transit, the location of cars on the various sections of the sidetrack. When a motorman is tramming along a haulageway and observes unsafe conditions, such as loose roof, displaced timber gob slides or defective track, he can report it at once. Should there be an accident in which personal injury is involved, the dispatcher can be notified and necessary first aid and assistance can be summoned. Arrangements can be made at the same time for expeditious transportation.

In connection with dispatching traffic underground, two other pieces of equipment have proved to be effective in safely speeding up the movement of trains. The first of these is automatic block signals. They are the three-target type with an amber, a green and red light, actuated by a trolley pole shoe contacting a switch along the trolley wire. It has been found that traffic can be speeded up with the greatest of safety with automatic block signals.

The other piece of equipment is the electric switchman for operating turnout switches and derails. Most of them are operated by the trolley pole shoe as it slides along the trolley wire. They are equipped with three-target type electric lights. Two are arrows indicating direction that the switch is thrown; blue indicates that the switch is for the straight, amber indicates that the switch is for the curve. Should the switchpoints not fit up tightly against the rail only the third light, a round red target, will burn. Trolley switches are located at a safe distance away so motormen can stop should the red light come on.

Conventional telephones, hand operated block signals and track switches are still being used and have a definite place in controlling underground traffic. A combination of trolley phones, automatic block signals and electric switchmen give a more efficient and a safer haulage system.

# Installation of Belt Conveyors

By A. E. LONG
*General Superintendent*
Clearfield Bituminous Coal Corp.

WHEN first considering the installation of belt conveyors careful estimates of the coal reserves available should be made in order to assure that depreciation costs will not be exorbitant. A good figure to use is a depreciation period of 10 years for conveyor frame work, all mechanical and electrical components, and five years for rubber belting. In main line haulage, installed as a permanent job, belt life should be much longer.

At transfer points where coal is discharged from one main line unit to another or where a branch unit is discharging, careful attention must be given to the type of device used to feed or transfer coal to the main unit.

When belt conveyors are used on main line entries, sufficient height must be available to permit the use of large diameter idlers. The belt should be installed in a straight line on concrete or other non-rotting piers, be levelled

transversely, laid out in vertical curves longitudinally, be high enough from bottom to permit good drainage and efficient inspection. More belting is worn out, on the return strand by edge wear on the feet of chairs than in any other way. Therefore, the installation should be such that the return strand of belting can be observed and inspected efficiently.

Belt conveyors in main line or main flat entry service should not be reversed as a regular practice because it will interfere with the continuous haulage of coal and because of poor tracking in reverse operation, contributes greatly to reduced belt life. Either rubber-tired or track mounted equipment can be used to handle supplies in, at least, main entry service.

Room or producing entry belts should be equipped with proper electrical overload devices, sequence controls (if they are discharging onto another belt conveyor), slippage controls and provided with a reversing arrangement.

Men have been injured by becoming entangled in the moving belt and safety should not be disregarded in installation plans. All belt conveyors should have an emergency control cord installed overhead and near one edge of the belt. This cord should be installed in such a way that when it is pulled the conveyor can be stopped from any point along the conveyor and it should be easily accessible to a man who might be riding on the belt. Wherever men have to cross over the belt conveyor a suitable bridge should be installed or electrical controls installed that will permit the conveyor to be stopped while a man is crossing. Clearance of at least 8 in. should be maintained on one side of the belt to facilitate inspection and provide room for greasing, etc.

To sum up: the use of the belt conveyors in coal mines, is not a cure-all and the cost of belt conveyors plus installation may appear staggering at first. However, if continuity of production can be maintained and sufficient tonnage is available it has proven a method to reduce haulage costs and by taking advantage of the potentialities of concentration also to reduce mining costs.

## Repair and Maintenance of Rubber Conveyor Belting

**By W. A. HASLAM**
*Assistant to the Vice-President*
**The New River Co.**

SEVERAL years ago a coal company which had installed belt conveyors in two of their mines found, after a period of two years, that the question of belt repair costs had become a major issue. In operating a coal mine a maintenance shop is necessary to repair equipment such as locomotives, cutting machines, chain conveyors, etc., so the management decided that it was equally necessary to have a similar shop to repair belting.

After some experience in operating their own belt repair shop, the company felt (as did other companies with similar experience) that the solution to the problem was to encourage the development of an outside commercial belt repair company in order to get better service at the same cost or less. This was done and a commercial service known as "West Virginia Belt and Cable Repairs" was established in Mount Hope, W. Va. The venture has developed to the point where it regularly employs about 25 men and now after some four years of operation there is available a great amount of skill and special knowledge.

The shop company's truck picks up the belts to be repaired at the mine and carries them to the plant where they are pulled across an inspection table and examined on both sides and edges for punctures or edgewear. Any punctures that will allow moisture to penetrate to the duck carcass, as well as rips, gouges, edgewear and moisture content are noted and marked. A report showing all the work necessary to put the belting into first-class working condition and a statement of the cost for repairing is sent to the coal company before any work is started. If a purchase order is forthcoming, the belting is then scheduled through the plant along with other belts in this order:

(1) The belt is placed in an oven where excess moisture is removed.
(2) It then takes its turn across one of seven long tables where the repair work is done.
(3) Wherever parts are cut or removed from the belt due to breaks, rips, punctures, mildew, etc. new material of the same weight and thickness are replaced and vulcanized.
(4) Where several short pieces of belt are sent in for repair, they are often spliced together and vulcanized, making one complete section.
(5) If necessary, and only as a last resort, where edgewear is excessive and the plies have separated, the belting is run through a cutting machine and a new edge applied by a special method.
(6) Completely repaired belt is returned to the mine.

Other services rendered by this commercial outfit are: Vulcanizing long slope conveyor belts to make them endless and on-the-job repairs which require special tools and know-how.

# CONTINUOUS MINING

## Pillar Extraction with Continuous Machines

**By J. A. YOUNKINS**
*Assistant General Superintendent*
**Duquesne Light Co.**

MR. YOUNKINS' paper appeared in the April issue of MINING CONGRESS JOURNAL.

## The BCR Col-Burster

**By GERALD VON STROH**
*Director*
**Mining Development Committee, B. C. R.**

CONTINUOUS Mining means the uninterrupted flow of coal from the seam to commercial transportation. Specifications worked out by the mining Advisory Group approved by the Mining Development Committee for a continuous mining machine envision a full face machine and establish the dimensional limitations which would permit such a machine to be practical. Because of the advantages of a full face machine, it is felt that the ultimate evolution of continuous mining machines will be in this direction.

With present systems of mining bituminous coal, true continuous mining is virtually impossible. So long as there is a need for the machine to make crosscuts, an element of cyclic operation is present. A crosscut can be made more readily by a full face machine incorporating the BCR coal burster rotor, than by a cyclic machine. The circular buttons mounted on the side of the cutting arms are actually on test unit No. 2 tungsten carbide tool

bits and increase the flexibility of the coal burster. In making a crosscut, the sides of the arm cut as much as do the leading bits. They make it possible for the machine to cut its way sideways as well as up and down and permit the mechanical increase in diameter of cut to compensate for any changes in seam height.

Since a full face machine must exert considerable and constant thrust against the face, to be most effective, supplemental thrust must be available while cutting a turn. This is supplied by a hydraulic jack pushing against the rib at the rear of the machine.

The final BCR machine will be so proportioned as to mine a 90° turn on a 20 ft center line radius without reversing. Since coal seams are not flat but tend to have hills and valleys provision is made to raise and lower the head by means of hydraulic cylinders and parallelogram mounting of the mining head.

Ability to mine up and down still do not provide enough flexibility. It is also necessary to mine along the sides of the hills and valleys. By extending the arms on either the right or the left side the operator could mine a complete loop sideways. The BCR coal burster rotors have been designed to provide for a very wide range of seam height.

If a full face machine can be developed flexible enough to meet all seam conditions it would offer:

(1) No lost time in repositioning the mining element output.
(2) Since there are no sudden changes or adjustments required in operating a full face machine less skill would be required on the part of the operator.
(3) A full face machine should provide greater tons per horsepower per minute and therefore consume less power.
(4) Flow of coal from full face machine would be constant, therefore transportation behind the machine and on the main line should be simpler.
(5) A full face machine would produce cleaner coal, as there would be less tendency to cut into the roof or floor.
(6) Large mass required to provide thrust for the full face machine should provide a better mounting for auxiliary equipment.
(7) In seams having banded impurities, the coal burster rotor should produce cleaner fine sizes of coal.

Partially offsetting these advantages is the possibility that in seams having abrupt rolls the percentage of recovery might be one or two percent less in extreme cases.

## The Goodman Mining and Loading Machine

**By H. C. McCOLLUM**
*Consulting Engineer*
**H. C. McCollum and Associates**

DEVELOPMENT of the Goodman Continuous Mining and Loading Machine has been under way for about two years. After field testing several types of cutting heads, a rotary cylindrical type was chosen and a pilot machine was built and shipped to a southern Illinois mine for testing on very hard, dense coal. The machine had sufficient flexibility to turn 14-ft cross cuts at 90° from a 14-ft room or entry. It can operate in low coal as it is only 34 in. high with a coal line of 28 in. The maximum height mineable with the first (low) model is 64 in. and it can mine six in. below the floor level.

It was designed to produce three tons per minute while cutting and an average of two tons per minute for a complete cycle of sumping, cutting, pulling out and swinging up of the head. Size consist of the face product was 80 percent over ¼ in.

The cutting head on this machine consists of a series of rotary discs revolving about a shaft and arranged with 4 position cutting bits to cut a 2½ in. kerf with 3½ in. cores between kerfs. Rotating conical core breakers (two to a cutting disc) break off the cores after the cutters have penetrated the coal about 2 in. It was found that the gathering head was not close enough to the face. This resulted in an accumulation of cut coal on the mine floor which the gathering head was unable to remove fast enough.

It was found possible to make a cut the full 42-in. width of the cutting head without excessive strain or horsepower consumption. Power consumption was about 60 percent of the capacity of the motors which indicated that an increase of cutting speed was possible even in coal of this density and hardness.

Water sprays are used to help control the dust which it was believed would not be excessive. The fact that there was too much dust is probably due to the regrinding of cuttings which were not picked up by the gathering head of the machine under test. The gathering head itself is similar to that of conventional loading machines and floats on the bottom for complete clean-up. It swings with the cutting head laterally and proved to be almost adequate.

After the trial operation in Illinois, the machine was rebuilt and is presently being tested in a Pennsylvania mine. Results obtained with the rebuilt machine are not conclusive enough as yet to publish as a record on performance.

## Jeffrey Colmol

**By FRANK R. ZACHAR**
*General Superintendent*
**Christopher Coal Co.**

MR. ZACHAR'S paper will be published in the July issue of MINING CONGRESS JOURNAL.

## Joy Continuous Miner

**By MILTON H. FIES**
*Manager Coal Operations*
**Alabama Power Co.**

THE Gorgas coal mine of Alabama Power Co. is located some 30 miles northwest of Birmingham in the Warrior coal field. In 1949 the mining division of the company began a study of machines to mine and load coal in one operation. Cost estimates under various assumptions of tonnage which would be produced per machine indicated greatly reduced cost of producing coal under the conditions as they exist at Gorgas. Since the size consist of the coal was not of great moment in a steam plant where pulverized coal is the chief fuel, the degrading of the coal brought about by the use of these machines was not consequential. It was recognized that the finer the coal, the higher the moisture content of the washed product, but the other advantages to be obtained offset this. It was also realized that in mines producing domestic coal, this matter of size consist is of consequence.

When the first miner was installed, early in 1950, it was found that the real problem was to transport the coal as fast as it could be mined. The two shuttle cars proved to be inadequate, and it was decided to place a 12 BU

loading machine between the miner and the shuttle cars. With the inclusion of the mechanical loader, the operation became more continuous. Minor delays did not affect the miner's production, as the bottom served as a temporary surge bin. The loader was also needed to clean up loose bottom coal, so less of the operator's attention was required to position the miner's discharge conveyor.

The system of mining employed at Gorgas is the conventional room and pillar system. The width of the rooms has been reduced to 16 ft, and the pillars to 10 ft. Previously, the rooms were 25 ft wide, and the pillars 20 ft. Thus percent recovery was increased some six percent. No effort is made to recover pillars in this mine, since support is left to recover the upper or Pratt bed, which is about 30 to 32 in. thick. Entry belts are used on the cross or room entries and these belts deliver coal to 6-ton drop bottom mine cars, 48-in. gauge.

After the study in 1949, one Joy continuous mining machine was ordered. The machine was delivered and put in operation January 3, 1950 and has been in use to date. Near the end of 1950, two additional machines were ordered for delivery in 1951. These machines were received and put in service, on January 15 and January 18, 1951 respectively. During 1951 the work of the three machines was studied in detail and three additional machines were ordered for delivery at the beginning of 1952. This makes a total of six now in operation at the Gorgas mine.

Before these machines were introduced, 4½ tons of washed coal per man per day were produced, including all of the men at the mine, management, clerical force, safetymen, and supply house men. For the last six months of 1950, the tons per man day on the same washed coal basis was 6.97. Beginning with March, 1951, with three machines in operation production went up to eight tons per man day and in January, 1952, rose to 9.02 tons per man day. In three years output per man day has more than doubled and the effectiveness of the last three continuous miners purchased has not yet been fully attained.

With the use of only three miners our safety record has been greatly improved, our production per man day doubled, and our costs per ton of coal produced greatly reduced in the face of higher wages and cost of material. In the use of these new machines and also in relation to the roof pinning the men connected with the labor organization at Gorgas have been most cooperative in every manner.

This also is a striking example where increased mechanization makes jobs rather than retards employment. Since we installed our first continuous miner in 1950, employment has increased 25 percent, and the average washed coal production increased from 2,291 tons per day in 1950 to 3,126 tons per day in 1951, and the average tons per day produced thus far in 1952 is 4,075.

## SAFETY

# Prevention of Fires to Underground Conveyor Belts

**By C. W. THOMPSON**
*Manager, Weirton Coal Co. Division*
**Weirton Steel Co.**

DANGER of underground mine fires has increased with the growing use of conveyor belt systems for the transportation of coal and rock. In general, belt conveyors contain three inflammable materials: (1) the belting itself, (2) oils and greases used for lubrication of rolls, idlers and drives and (3) electrical cables together with electrical insulations. However, other inflammable materials such as coal dust and timbers, are usually present in the adjacent areas and may also be ignited. Fire prevention rules should cover every known condition which might lead to the propogation of fires by the action of belt conveyors and should further include steps to be taken at all times to eliminate fire hazards where belt conveyors are used.

A general set of rules for the prevention of fires to underground belt conveyors, under all mining conditions, might be rather difficult to formulate. However, experience here and abroad indicate that definite practices should be adopted for the safe operation of belt conveyors underground. These practices can be broken down in to the following: Installation, operation, and ventilation.

Operating standards are not the same at every mine, but belt entries should be kept clean of loose material from rib to rib, and accumulation of coal dust, oil, grease, etc., around belt head, belt tail, loading points etc., . . . should be removed when necessary. Dust, coal slate or other material should be kept cleaned off belt framework and the floor below.

Installation procedure by trained crews is more or less standard. The greatest cause of belt mortality underground is edge wear, and proper installation will go a long way to eliminate this.

Proper installation of all energy lines, and the necessary controls to assure a maximum of safety and a minimum in breakdowns is a must. To assure this the following automatic electric controls and other measures will go far towards eliminating the hazards incidental to mining; a device to prevent motor overload; sequence control of belts in series; prevention of pulley slippage; elimination of choking or pile-up at transfer and discharge points.

Ample ventilation is needed at all times in any mine and special care and thought should be given to the mining system and the control of air currents, to provide safe egress for men in case of emergency. All-belt installations should be on a separate intake ventilation split. Incombustible stoppings should be erected between intake and return, and provided with incombustible self closing doors at about 300-ft intervals. Water lines in the intake entry paralleling the belt should be provided with taps at 300-ft intervals and 150 ft of water hose and 25 sacks of rock dust should be provided at each of these points. Two all-service gas masks should be provided at drives, tail end and at discharge or loading points. An incombustible door should be provided in the regulating medium on the return side, and if any fire cannot be contained, this door, along with those previously provided in the intakes, can be closed and the section sealed.

The one statement that means more to the elimination of underground belt fires than any other is KEEP YOUR HOUSE CLEAN. If you have the misfortune to have a belt fire it is much easier to contain and control if only the belt is involved.

# Man-Trips With Belt Haulage

**By E. D. CONAWAY**
*Mining Engineer*
**Robinson and Robinson, Charleston, W. Va.**

MOST haulage accidents are not related to man-trips, but mass movements of a large number of men present potential hazards that cannot escape the serious consideration of any safety conscious person or group. Transportation by belt conveyors is a relatively safe method of handling men to or from the working places. Grades will not cause runaways of the man-trip, human failures

will not result in wrecks, and normal timbering and patrol of belts will eliminate the possibility of slate falls on a group of moving men. There is no exposed trolley wire immediately adjacent to the belt to present a hazard.

The major item of control with respect to belt man-trips is belt speed. Federal and State regulations require that men shall not get on or off a belt moving faster than 225 to 250 fpm, approximately 2½ mph. Experience and common sense require that men be provided with a reasonable chance to get on belts, ride, be alerted and get off without risk of personal injury.

Adequate clearance at points provided for men to get on and off belts is essential. Clearance over the belt is also very important. At least 24 in. should be provided and that much or more is required by State and Federal regulations.

Since belts normally run at speeds higher than those used for man-trips, the solution is two-speed control. This can be done by use of two-speed motors or two motors on the same shaft. In the second instance, the slower motor will run idle while the belt is hauling coal.

Controls can be provided to insure safety of the men after they are on the belt. Stop and start switches, at 300 ft or less, intervals along the belt within reach of the men, is one method. By sectionalizing these controls, further safety is provided as the belt, once stopped, can only be started within the control area from where it was stopped.

It has been found that men can easily get on or off a flat belt where a platform is built up to the level of the belting. Special troughing idlers which will allow the belt to be flattened for man-trips and troughed for hauling coal can be installed at these points.

Adequate light should be provided to illuminate the loading and unloading stations properly. Warning lights should be maintained constantly at an adequate distance before each unloading point is reached. If a man fails to get off at the proper point, an electric eye or other mechanical devices can be provided to stop the belt.

Federal regulations require the space between men riding on a belt line shall not be less than five ft. This distance can be controlled by a turnstile combined with a timing device which will allow only one man to get on the belt at a time; and at the proper distance behind the person preceding him.

Personal safety can be provided once a competent supervisor has set up complete control of all devices. Men can get on a belt in an area of adequate clearance, ride safely on the belt where adequate vertical clearance is maintained, be warned that it is necessary to get off the belt, and leave the belt under conditions that are safe for any individual.

## Handling Man-Trips By Rail Haulage

**By F. F. STEWART**
*Superintendent*
**Jewell Ridge Coal Co.**

TRANSPORTATION of men underground has become, in recent years, an integral part of coal's production problem. In order to operate man-trips by rail haulage satisfactorily a number of important points must be considered.

Rules and regulations are needed to govern the operations and performances of the trips and require strict adherence. Detailed studies of man-trip performances will bring to light wasted minutes generally overlooked by casual observation. Equipment should be able to transport men in a safe and economical manner at a speed within the limits of existing State Law. It is necessary to provide and maintain haulage roads to serve the dual purpose of fast, safe, economical haulage for man-trips and coal.

An example of good man-trip handling follows. The mine was opened in 1949. To date it presents no complicated haulage or man-trip problems. Distances to the working faces are relatively short but every effort has been made to keep the main line haulway reasonably close and secondary haulways serviceable. There are five working sections served by rail haulage.

Operations are on a two-shift basis. The first shift man-trips enter the mine at 6:30 a. m. and return to the surface at 2:30 p. m. The second shift enters the mine at 3:00 p. m. and returns to the surface at 11:00 p. m. The foreman of each trip has the responsibility of seeing that the men are loaded and properly seated. At the starting time the dispatcher signals the trips to leave. Each inside man station is located 200 ft outby the loading point and is moved up as the loading point is moved. The men unload at this point and walk the remaining distance to the face. This distance varies, of course, with the advance but the maximum from any one man station is 650 ft and the minimum is 300 ft.

At the established quitting time, the men stop work and walk back to the loading point, report to their foreman and then proceed to the man-trip station. Time studies have shown the average time for this operation is five minutes. So all sections quit five minutes before the man-trip is scheduled to leave.

## Coal Dust Control Underground

**By ERNEST DOHERTY**
*Engineer*
**Anthracite Institute**

MR. DOHERTY'S paper appeared in the May issue of MINING CONGRESS JOURNAL.

# MAINTENANCE AND POWER

## Centralized Lubrication for Coal Preparation Plants

**By W. H. CARTER**
*Master Mechanic*
**West Virginia Coal & Coke Corp.**

ONE of the most important considerations in preventive maintenance is lubrication. It has been said that every electrical failure was first a mechanical failure, and every mechanical failure was first a lubrication failure. One of the greatest obstacles to adequate lubrication is the human element. An automatic lubrication system minimizes this obstacle.

One of the first steps in setting up a lubrication plan is a study to determine the correct lubricant to use. Where large quantities of lubricants are used, standardizing on the minimum kinds required simplifies the storage and handling problem and instructions to the people who apply them. Automatic lubricating systems, make simplification an easy matter since only one oil or grease can be used in the system at one time. In Dorrance Colliery we use one oil and one grease for general lubrication.

These factors, and the size and complexity of Dorrance Colliery prompted consideration of automatic lubrication wherever possible. It was decided to connect as many

points as possible to the automatic system. More than 600 are now automatically lubricated. This is in addition to automatic oilers for conveyor chains which we built in our own shops. There are also automatic sight feed oilers feeding a different grade of oil to sprocket drive chains. The sight feed oilers feed lubricant by gravity from a reservoir through a solenoid operated valve and a sight feed valve to a brush which rides the sprocket chain and spreads the desired amount of oil evenly. The solenoid valve is connected to the driving motor power circuit so that oil is fed to the chain only while it is running. The same type of oiler is used to lubricate shaker eccentrics.

Our automatic greasing system was built by the Farval Corp. and there are three of them in service. One installation, lubricating all points in the plant, can be connected to the general purpose lubricant and each headhouse has its separate system. An electric clock controls the timing cycle so the pump operates every half hour. Five min are allowed for pumping time with a five-min overtime period. When the pump has operated 10 min, the controller shuts it off and actuates an alarm which starts the mechanics hunting for the trouble, usually a broken line. The salient features of this lubricating system are:

(1) A positive placement piston pump with a sliding valve eccentrically connected to the same drive shaft to which the main piston is connected. (2) A reservoir tank with a heavy follower plate resting on top of the grease.

The distribution piping is a dual header loop system. For each greasing circuit, two lines are carried from the pumping unit to a point close to each bearing and back to the pumping unit. There are approximately 4000 ft of distribution lines in this system.

The reversing valve receives lubricant under pressure from the pump and alternately applies this pressure to the distribution loops. It is a necessary part of the cycling control. The pressure at which the valve reverses is set high enough to insure the operation of all the measuring valves.

Equally important to operation of the system are the measuring valves. These valves are usually mounted in manifolds of from two to a dozen or more. They are pressure operated reversing valves embodying much the same idea as the reversing valve at the pump.

Since the pump and valves are simple the whole system is simple. The only electrical relays required are the clock controlled starter and the maintaining contact double throw switch operated by the reversing valve. The clock and starter are energized from the plant control panel thus making operation of the lubrication system automatic as the plant is started and stopped. All the power required by the system is supplied by the motor which drives the lubricant pump.

General lubrication is provided by the Farval system pumping grease to bearings and the coal spray oil system pumping oil to conveyor chains. Anti-friction bearings, of which there are many, require small amounts of grease and are lubricated by hand on schedule. Speed reducers fall into two classes and require two more oils. The oil level in each speed reducer is checked on schedule. The only other oil required is the air-compressor oil, which is also used in the reservoir oilers applied to the shaker-eccentrics described before.

All sessions were well attended

## Lubrication of Underground Equipment

By EVAN ADAMS
*General Superintendent*
The Jefferson Coal Co.

MANY companies have found that their installations of mechanical loading equipment have not given the production calculated on paper; and many are at a loss to understand why this is true. There are many possible reasons for this, but to get the maximum productivity from mechanical units, they must be adequately serviced with supplies, cars and an effective maintenance program.

A good maintenance program is based on six important facts: (1) adequate power; (2) a scientific lubrication program; (3) preventive maintenance work; (4) periodic overhauls and rebuilds; (5) good face preparation of coal; and (6) cooperation and coordination between the production and maintenance departments.

Several methods of lubricating machinery were tried at Piney Fork Mine after it was mechanized. First, the machine operators and helpers were given the job of lubrication on their own machines. Oil and grease were kept on the section, and each operator was supplied with the necessary grease guns and other equipment needed. This system did not work out because: First, the operator is primarily concerned with the production of coal, lubrication is almost the last thing he will have on his mind. Second, waste was terrific; grease guns were lost or broken entirely too often, and drums of grease and oil were apt to be left behind when the section was moved.

The next method tried was to put a mechanic on each section to do the lubricating. This was an improvement. A much better job of lubrication was done and the loss of material was not nearly so great. However, it was uneconomical to have one man on each crew, solely in case of breakdown and to lubricate the machinery.

Next two men were put on as oilers for each shift. These men walked from section to section and lubricated each machine as they came to it. Now two oilers on each working shift are equipped with a locomotive, supply car, and a grease truck. The grease truck has tanks for hydraulic and transmission oil, and also a tank for semi-fluid grease. An air compressor is mounted on the truck to operate a high-pressure grease gun and oil pumps. Grease for gear and chain cases is carried in the supply car. The oilers travel from section to section with their outfit, and are under the supervision of the inside maintenance foreman. While traveling, they are in constant communication with the dispatcher, through the "trolley phone," standard on all haulage and supply motors.

When this system was first set up, an agreement was reached with the production department so that the oilers would have priority over all other traffic except haulage trips. When oilers arrive on a section, the one acting as triprider contacts the section foreman who directs him to either the cutting or loading machine first,

as he sees fit. It is the duty of the section foreman to clear the way for them so they can lubricate the machinery and get out of the section with the least possible interference to production and delay to themselves. Barring unusual difficulties, lubricating time averages about 15 min each for the loading machine and the cutting machine.

The advantages of this method of lubricating are many. First, it is good lubrication. Next, comes the safety of having a minimum of oil and grease in the mine. With the exception of the grease truck itself, the only oil and grease kept in the mine is a five-gal can of hydraulic oil on each section and one barrel of hydraulic oil kept in a fireproof oil station in each side of the mine. Third, it is very economical. Oil and grease wastage is kept to a minimum, and the oil and grease are kept free of dirt and other impurities.

Good lubrication is one of the most important contributions to long machinery life. Any time or effort spent in developing a scientific lubrication program and its proper administration is well spent, and pays off many-fold in decreased maintenance and capital expenditure costs, plus increased productivity.

## Underground Power Transmission

**By URBAN F. TOUCHER**
*Chief Electrician and Master Mechanic*
**The Union Pacific Coal Co.**

THE Union Pacific Coal Co. operates a modern power plant, generating all the power for its mine use. Transmission is at 34,500 v from the power plants stepped down to 2400 v at sub-stations strategically located in conformity with the mining plan and distributed to the underground areas through boreholes. Lightning protection, ground detection and switching facilities are provided on the surface at all borehole locations with adequate short circuit capability. The switches at the bottom of the boreholes are housed in fire-resisting enclosures and heavily rock dusted.

Circuits from the underground switching stations are carried over 4/0, three conductor cables, rubber insulated, and wrapped with steel tape armor. The cables are hung on a ⅜-in. galvanized steel messenger, supported by brackets mounted on well set mine timber. Where cables cross hoisting slopes, or other haulageways, they are carried beneath the track in metallic conduit buried 18 in. deep. The messenger is connected to the cable sheath and to the salt grounds at intervals of 500 ft, as well as to the mine track system and borehole casings.

Conversion units installed at their respective load centers consist of four 300 kw portable ignitron rectifiers and two motor generator units of 200 and 300 kw ratings. Placing two or more units in parallel is common practice to forestall poor voltage in areas between load centers. No special difficulty has been encountered when motor generator units are in parallel with rectifiers, providing the distance between the units is sufficient to compensate for the overcompounding characteristics of the generators. Whenever motor generators are paralleled with rectifier units, reverse current protection is necessary on the dc breaker at the generator station.

Main feeders in the direct current system are 1,000,000 cm. The positive conductor is insulated and the negative bare. The main feeders are installed in fletcher type hangers with lag screw supports on mine timber. Whenever the conductors cross haulageways, they are carried beneath the road bed in metallic conduit.

The branch circuits are either 4/0 or 6/0 trolley wires supplemented by 500,000 cm parallel feeders supported by dual type hangars. Each branch circuit is sectionalized from the main feeder by a switch and an automatic reclosing circuit breaker. Sectionalizing switches are placed at 1500-ft intervals with green lights to indicate the location of such switches. Hot nipping has been replaced by approved clamping devices with fused switches and plugs located conveniently in pure air intake airways. The negative feeder is continuous and connected to the electrically bonded mine track system at all convenient points. The interconnected network, consisting of the mine track, salt ground media, negative return feeder, messenger cable borehole casings and mine water discharge piping system, serves as a vast low resistance grounding mat.

It is a mandatory and established practice that all conduits, cable sheaths, frames, casings or enclosures that may become accidentally charged with electric current be effectively grounded at all times. Indispensable in handling electric power and apparatus are constant vigilance and inspection. Off track mining equipment, such as mining machines, loading machines, shuttle cars, shaker and belt conveyors, drills, etc. are frame grounded by continuous electrical conductors incorporated in the power cables, and securely attached to the mine track system at a location remote from the negative feeder. Power cables used on portable equipment are hung to prevent injury by moving equipment or falling objects.

The toughest underground power transmission problems have their origin in trailing cables used on mobile equipment. The problems are mostly mechanical in nature, involving, of course, the human element. Running over the cable, bending and twisting of cables around sharp corners or objects and excessive cable reel tension are usually the contributing factors for cable failures, and their elimination rests within the sphere of better educational programs in operation and maintenance. Adequate electrical protection by circuit breaker and ground trip schemes to limit destructive arcing have proven their worth; however, the anathema of cable failures and splices will continue to plague mobile mining as long as trailing cables are used carelessly.

## Underground Power Transmission

**By W. R. WOOD**
*Electrical Superintendent*
**Berwind-White Coal Mining Co.**

THE mines of the Berwind-White Coal Mining Co. near Windber, Pa., were first electrified soon after the turn of the century. Five-fifty v dc was selected for use in the mines. In the years following, the electric system has kept pace with the various mining methods as they have developed.

Sixty-six hundred v, 3-phase, 25-cycle power is generated in a central power plant of 20,000 kw generator capacity. Transmission voltages are 6600 v to nearby mines and 13,200 v to outlying mines. Longest line is 13 miles.

Mine fans and other surface equipment are driven by ac motors. Two large underground pumping stations are supplied with ac power through boreholes; one at 2200 v and the other at 440 v. All other power used underground is 550 dc.

Conversion from ac to dc is accomplished by synchronous converter substations on the surface located as required to suit the mining load. A total of 10 substations are now in service, having synchronous converter capacity of 6600 kw plus standard mine overload rating. Three of the substations feed power into the mine system at drift portals. Seven feed power through boreholes or conduits down the shaft opening.

Boreholes are preferred to supply the mine feeder system from the surface substation, because of several factors which include maximum safety, minimum maintenance and maximum reliability. By use of boreholes all hazards, except cable failure due to insulation failure or overheating, are eliminated. The newer types of rubber and rub-

ber-like compounds provide a waterproof and tough resilient covering for the conductors less ideal for borehole installation. In recent years no failures have occurred while using cables insulated with a rubber-like compound and covered with a neoprene jacket.

For boreholes we use 500,000 CM copper, 37 wire strand, hard drawn when available; otherwise, medium or soft drawn serves adequately for depths up to 1000 ft. Reasons for selecting 500,000 CM borehole cable are principally ease of handling and placing in the borehole. There is some benefit from use of multiple conductors in current carrying capacity, but not as much as in the case of open work.

Considerable care is taken to see that cables in parallel are well connected at the terminals and occasional tests are made to be sure that the connections remain in good condition so that the current will be evenly divided in the several cables.

The structures for supporting the borehole cables are built of structural steel so as to simplify cable installations and are strong and rigid enough to withstand unusual stresses during installation.

The deepest borehole was installed last summer and is 1040 ft deep. Four neoprene jacketed positive feeders were let down together with four weatherproof triple braid covered negatives all in one six-in. steel lined borehole. Each cable was put down separately and clamped firmly to the support before the next cable was put down.

In order to minimize twining of the cables while being lowered in the pipe, a piece of round steel bar about two feet long and slightly larger than the overall diameter of the cable is attached to the end of the cable by means of a concentric cable splicer or connector brazed to the end of the steel bar. We had used a small rounded thimble on the cable end for this purpose but find that the extra weight of the bar is useful in obtaining better cable placement and with less jamming.

To prevent possible abrasion and insulation damage at the top and bottom of the pipe, a bushing of bakelite was made to fit neatly inside the pipe and with a shoulder to rest on the edge of the pipe. The inside of the bushing was machined to carefully determined dimensions to distribute the pressure on the cable insulation so that it would not be crushed at that point.

Actual installation of the cable is not difficult. First a sheave wheel about 3½ ft diam is mounted at the base of the supporting structure so that it will feed into the pipe. The cable is unreeled by mounting the reel on an axle and drawing the cable off by use of a small tractor or truck. The end with guide weight attached is run over the sheave and started down the hole. Until enough cable is hanging in the hole it must be fed in by dragging it toward the hole. As soon as the hung weight is great enough to overcome the dragging friction of the cable on the ground, the remainder of the cable is allowed to run in under control of a winch. When the proper point is reached, the winch holds the cable in place while a clamp is attached. Then a ratchet hoist is used to pull the clamp and cable to the top of the structure where the clamp is fastened from the hoist to the clamp suspension and the hoist is removed. If a second clamp is used it is now applied and the permanent suspension is completed.

## Maintenance in a Continuous Mining Section

**By G. W. STUMP**
*Assistant Production Manager*
**Rochester & Pittsburgh Coal Co.**

MR. STUMP'S paper appeared in the May issue of MINING CONGRESS JOURNAL.

# COAL PREPARATION

## Recovery and Preparation of Fine Coal From Slurries

**By JAMES P. BLAIR**
*Coal Preparation Engineer*
**Heyl and Patterson, Inc.**

DEVELOPMENTS of recent years have influenced operators to consider many methods of fine coal recovery. The increased adoption of mechanized mining has caused a corresponding higher percentage fines in the run of mine product. Desire to stretch dwindling coal resources has been a contributing factor as has been the development of combustion equipment for the finer sizes. Improved processing units and new preparation methods have been introduced.

The problem of disposing of plant effluent is acute, particularly in areas such as the West Virginia fields where space is not available for huge sludge ponds. In addition, several states are making it unlawful to contaminate streams with plant effluents.

Unfortunately the ash content of most coals increases as the particle size decreases. In seams where the coal is hard and the dirt associated with it relatively friable the finer sizes of coal contain the greatest amounts of ash. However, when the coal is of high friability, the increase of ash with lessening particle size is not so pronounced, and in a few cases the finer sizes contain even less ash. A study of the ash versus particle size curve should be made when contemplating processing equipment, especially if the coal recovered is to be sold.

Increased attention is being given the recovery and preparation of fines from impounding areas and coarse coal plant effluents in both the anthracite and bituminous fields. New equipment and modifications and improvements to existing equipment are simplifying the technical problems involved in recovering, handling, cleaning and dewatering fine coal below ½ mm in size.

## Heated Cloth Screening

**By J. E. DUNN**
*Processing Machinery Department*
**Allis-Chalmers Manufacturing Co.**
**and**
**M. W. SUMMERS**
*Vice-President*
**Westmoreland Coal Co.**

SCREEN cloth heating is not new, whether accomplished by flame heating, resistance heating or by radiation from tubes placed below the screen surface. During the past few years considerable research has been undertaken by manufacturers of vibrating screens, and at the present time the majority of the manufacturers have developed, or are in the process of developing, a heating unit adapted to their screens.

The screen heating unit at the Madison, W. Va., cleaning plant of the Westmoreland Coal Co. consists of one or more transformers of the variable voltage type. Transformers range in size from 5 to 30 kva primary voltage, 220 or 440 v secondary voltage, 2 to 10 v, depending upon the area of the screen, specification of the screen cloth, and whether carbon steel or stainless steel is used. Flexi-

ble leads are used from the transformer to conduct the current to the screen cloth.

When passing moist coal over and through the screen cloth, fine particles adhere to the wires due to the surface tension of the moisture. Heating the wires heats and evaporates the moisture in contact with them and releases the adhering particles. Partial or complete evaporation of the thin film of water between the heated wires and adhering particles takes place very rapidly, and the attachment is quickly broken by the screen vibration. The required temperature of the screen cloth to prevent blinding will vary with the temperature of the feed and the ambient temperature. Generally if the screen cloth is heated from 160 to 180° F, blinding will be eliminated even when handling high moisture coal.

The Westmoreland Preparation Plant capacity is 420 tph of 8-in. by 0 coal mined from the Hampton Seam. Four Ripl-Flo screens receive a feed of approximately 250 to 300 tph of 1½ in. by 0 coal. There are four screens in parallel. Screens 1, 2 and 3 receive 90 percent of the feed, and screen 4 receives only 10 percent to take care of surge loads which are encountered in all plants.

Ambient and material temperatures have a direct bearing on the cooling of the screen, therefore if the temperature is low, more power would have to be applied. At present the transformers at the Westmoreland installation are operated at 4½ v secondary and at this setting the cloth is heated to approximately 100° F which is sufficient to prevent blinding when handling moist coal at intervals.

When operating the transformer at 7.5 v during winter operations, the electric power cost is about 0.5 cents per ton of feed. The cost of a heating unit varies according to the manufacturer's design, size of screen, mesh of wire cloth, whether stainless or carbon steel, type of transformers, etc. An estimate would be from $1500 for a small screen to approximately $4000 for a large screen.

# Methods of Fine Coal Recovery

**By S. M. PARMLEY**
*Consulting Engineer*
**Pittsburgh, Pa.**

HIGH production costs, increased ash and sulphur in raw coal and stream pollution laws have instilled new thinking into the recovery of fine coal slurries.

Froth flotation has been in use in the coal industry in the United States since 1931, but has not been applied to the recovery and cleaning of fine coal slurry to any extent until recent years.

Slurry is a function of the water system, so full consideration should be given to the dimensions and type of water clarification, and slurry recovery and dewatering units, to ensure choosing units with a reasonable capital expenditure and operating cost.

Until recently the froth flotation method of cleaning slurries did not meet with much favor here due to its high capital and operating costs, and its inherent temperamental operating conditions. In Europe and England froth flotation plants have been adopted to a very great extent. Western Germany has more froth flotation plants and treats a larger tonnage by this process than any of the other countries on the Continent. The Dutch State Mines in the Limburg Province, Netherlands, has probably the largest single froth flotation plant in the world.

Generalizations are dangerous in coal preparation but until a cleaning method of equal range is found, froth flotation should be extensively applied where fine coal must be cleaned.

A study of the problem should consider the economies of froth flotation, versus wasting to slurry ponds and disposal to banks. The cleaned slurry may yield a profit after deducting for operating labor and amortization of the possible high capital cost.

Design of a froth flotation plant for high efficiency and uniform product requires consideration of the following:

(1) Economics of treating the slurry by froth flotation.
(2) Type of flotation unit and number needed to avoid overloading cells.
(3) Density of the feed.
(4) Conditioning time.
(5) Flexibility of the flotation cells for retreatment.
(6) Breaking the froth to obtain the maximum capacity of the filters.
(7) Type of filter units.
(8) Disposal of the tailings.
(9) Kind and quantity of reagents and application.

A froth flotation plant, under proper operation, will generally produce an acceptable clean coal and a white water tailings, containing principally clays.

The methods of tailings disposal is one of the problems connected with froth flotation. If quantity of tailings is small, disposal to ponds or waste banks may be feasible and economical. Tailings may be responsive to thickening by rake thickeners or by cyclones with thickened underflow, disposed to ponds. Tailings of high clay content may be clarified by flocculation and thickening.

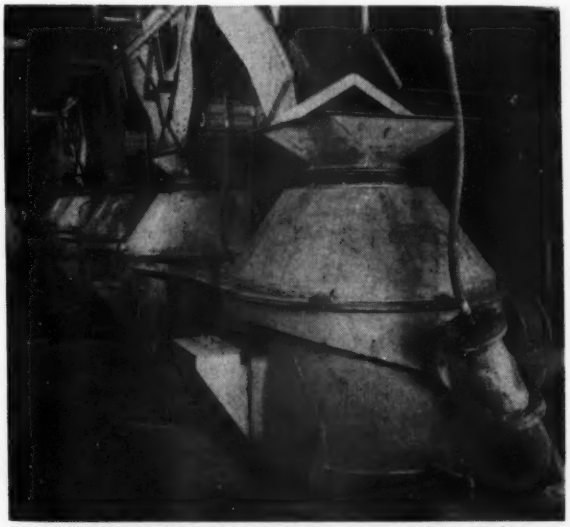
Since the passing of stream pollution laws, more consideration has been given to clarification by flocculation of washery circulation water containing a high percentage of minus 325 mesh clays.

Considerable research work has been accomplished in England and Europe on the clarification of washery circulating water by flocculation.

British practice of froth flotation differs from that in the United States in that British plants are usually operated on a closed system. In the British and European practice, cresylic acid and creosote are used universally as reagents.

At the Champion No. 1 Preparation Plant of the Pittsburgh Coal Co., cresylic acid was found to be one of the best frothing reagents in respect to cleaning performance and together with kerosene and spray oil produced the best results in mill operation.

Breaking the froth to a liquid condition for satisfactory filtering on vacuum type filters is a problem. In the United States water sprays, vibrating screens, centri-



**Coal drying is becoming more and more important in fine coal preparation**

fugal impellers in a tank or froth breaker and high speed belt elevators have been used to break the froth.

Western German practice in the handling of froth flotation products usually includes a vacuum tank type of froth destroyer to condition the froth concentrate before it is delivered to the filters.

Considerable investigation and research has been accomplished on the application of heavy media in the cleaning of ½ in. by 100 mesh fine coal.

P. J. Van Der Walt has published a treatise on the operation of the cyclone washer and its application to Witbank fine coal. He states that the cyclone washer treating fine coal (½ in. by 100 mesh) is very nearly equal to that of the conventional types of heavy media washers treating coarse coal.

Due to the high cost of producing coal and the increasing ash and sulphur content of most fine coals there will probably be more interest and application of froth flotation methods by coal operators in the United States.

## Dense Media Separation By Tromp Process

**By J. W. MacDONALD**
*Chief Engineer*
**Old Ben Coal Corp.**

THE initial installation of Tromp bath equipment in the United States was placed in operation during December 1951. European development of the Tromp bath was principally directed toward a three product separation, however the McNally-Tromp heavy density cleaning unit is designed for a two product separation.

The installation under review is located at mine No. 22 of the Old Ben Coal Corp., at Valier, Ill. It consists essentially of five McNally-Tromp bath units for preparation of the 7 by 2 in. and 2 by 5/16 in. sizes with the 5/16 in. by 0 fine coal being cleaned by Rheolaveur launders. The preparation plant was designed to accommodate a raw feed of 800 tph. Hoisting or "foreign coal" delivery may provide a total of 850 tph.

Primary separation is made in two coarse and two small coal bath units. Secondary separation of the primary sink material is made in a single bath unit. It provides a float product or middlings which is crushed and recirculated. Raw coal screening can provide 312 tph maximum of 7 by 2-in. coarse coal with subsequent delivery to the two 8-ft wide McNally-Tromp bath units. Primary separation of the course coal is made at 1.36 Sp.G within each bath. The cleaned coal is rinsed, drained and classified for continuous loading.

Four vibrating screens remove the 5/16 in. by 0 and provide about 256 tph of 2 by 5/16 in. raw coal. Crushed middlings are recirculated and increase the division to a maximum total of 286 tph. Cleaning follows in two 8-ft wide bath units.

The 2 by 5/16-in. feed to the small coal baths is separated at 1.43 Sp G. Cleaned coal is rinsed, drained and classified before delivery to the washed coal bins. Measuring feeders under these bins enable blended assembly for prescription loading. The 1 by 5/16 in. portion of the sink material is delivered to the refuse surge bin. The 2 by 1-in. portion of the small coal sink material, assembled with the 7 by 2-in. sink material, is delivered to a single 6-ft wide McNally-Tromp bath for recovery of a middlings product. Heavy density separation is made at 1.60 Sp. G with the sink material passing to refuse.

Float or recovered middlings are crushed to free the salable coal from adhering boney or shale. Recirculation is provided by assembly with the raw coal passing to the blending bins. The 5/16 in. by 0 fine coal is prepared in duplicate parallel Rheolaveur launders.

Heavy density of the separating media is provided by the use of fine magnetite. Local grinding provides reduction with around one or two per cent plus 80 mesh and nearly 70 percent of 200 M by 0. Magnetite is recovered from the rinse water by hydraulic classification.

Washed coal, middlings and refuse are rinsed successively in a mixture of dilute media, clarified water and fresh or makeup water for removal of magnetite. The assembled drainage provides a dilute media, recirculated in part for subsequent rinsing. The major portion of the dilute media is delivered to a revolving screen, and a circle throw vibrating screen for separation at 80 mesh. Oversize material is assembled with the fine coal and delivered to the Rheolaveur launders.

Eighty M by 0 through product is passed to duplicate 18-ft diam settling cones for a classified separation of magnetite from the coal and slimes. The gravity differential between the 5.0 to 5.2-Sp.G ore and the expected average of around 1.50 for the coal and slimes, facilitate acceptable separation.

Solids content in the water overflow passing to waste, averaged 2.61, 2.54 and 2.61 percent during the first three months of 1952. Daily tests show operation within narrow limits of the average findings. An optimum solids ratio will afford protection against undue loss of magnetite in the recovery circuit.

**The Convention's climax was the Annual Banquet**

# Wheels of GOVERNMENT

AMC

**As Viewed by A. W. DICKINSON of the American Mining Congress**

OUTSTANDING above all else in Washington and the nation is the Supreme Court's six to three decision of June 2 declaring the Administration's seizure of the steel plants illegal. The Court has thus confirmed Federal District Judge David A. Pine in his ruling of April 29 that the President's action was illegal; that there was an "utter and complete lack of authoritative support" in law and in the Constitution for the Government's position; that the damage would be irreparable; and that there was no proof that the Taft-Hartley Act would not be effective, if tried, or if it failed, that the Congress would neglect to protect the country.

In writing the majority opinion, Justice Hugo L. Black of Alabama said in part: "That this is a job for the nation's lawmakers, not for its military authorities. . . . The founders of this nation entrusted the lawmaking power to the Congress alone in both good and bad times. It would do no good to recall the historic events, the fears of power and the hopes for freedom that lay behind their choice. Such a review would but confirm our ruling that this seizure cannot stand."

Both Senate and House, with an early summer adjournment in the offing, are expediting all necessary legislation including particularly the appropriations bills for the fiscal year 1953. The Senate is making some restorations in funds reductions made by the House, and the Joint Congressional Committee on Internal Revenue Taxation now estimates a Federal deficit of $5.7 billion for the current fiscal year ending June 30; this is $2.5 billion less than the Administration's forecast.

## Defense Production Act

The Senate Committee on Banking and Currency on May 21 reported to the Senate the Maybank (Dem., S. C.) bill continuing the life of the Defense Production Act; extending price and wage control authority through February 28, 1953, and allocation, priorities, rent and defense powers through June 30, 1953. The measure is under debate on the Senate floor, with passage anticipated at an early date.

Changes in the current law approved by the committee include: (1) an amendment by Senator Dirksen (Rep., Ill.) which would require the WSB to be composed solely of public members (subject to Senate confirmation) and would strip WSB of authority to decide labor disputes; (2) an amendment by Senator Capehart (Rep., Ind.) clarifying the original Capehart amendment to provide that it does not apply to wholesalers and retailers; (3) a revision of the Herlong amendment in the present law which would require OPS to bring all of its existing regulations affecting wholesalers and retailers up to date by allowing them ceiling prices which reflect the historical margins they had before Korea; (4) an amendment by Senator Bricker (Rep., Ohio) which would require OPS to honor State minimum price laws to the extent that where the State minimums are higher than present OPS maximums, the State laws are to prevail over OPS regulations; (5) an amendment by Senator Knowland (Rep., Calif.) which would exempt from price control port and marine terminal charges and all fees, charges or rates charged by State or local governments; (6) an amendment by Senator Bricker which would exempt professional engineers, accountants and architects from salary controls; (7) an amendment which would exempt from price control common carriers whose rates are under the jurisdiction of State or local bodies; and (8) an amendment to the Walsh-Healey Act to exempt Government purchases of goods that can be bought on the open market, and to permit judicial review of Labor Department minimum wage determinations under that act.

The House Committee has completed hearings on its DPA extension bill and is considering the measure in executive session.

### Washington Highlights

**CONGRESS:** Plans early summer adjournment.

**DEFENSE ACT:** Passage expected soon.

**W. S. BOARD:** House Labor Committee criticizes.

**ST. LAWRENCE:** Scheduled for Senate floor battle.

**COAL MINE SAFETY:** Senate passes Neely bill.

## WSB Investigation

Since May 6 the House Education and Labor Committee has been carrying on its investigation of the Wage Stabilization Board. Former Defense Mobilizer Wilson testified that it is impossible for WSB to both regulate wages and settle major disputes; that it should be stripped of its disputes functions and be made an all-public member board.

The committee kept WSB Chairman Feinsinger on the stand for three days, in the course of which he was sharply criticized for the Board's union shop recommendation and for its attempts to mediate the steel dispute after submitting its recommendations. Chairman Graham Barden (Dem., N. C.) charged Feinsinger with "putting a gun to the head of the employers on the union shop."

One industry member of the Board, George W. Armstrong, Jr., president, Texas Steel Co., emphasized in his testimony that industry-wide bargaining should be outlawed by Congress and that WSB should be stripped of any power to settle labor disputes. He asserted that WSB had stimulated labor-management disputes and had substituted its own powers for those

provided in the Taft-Hartley Act. Another industry member of the Board, Richard P. Doherty, urged that the Board be abolished before it plunges the nation into a "very real recession." Doherty continued that present economic conditions "fully justify putting wage stabilization in the deep freezer," and that if it is to be continued its activities should be limited to problems which bear upon the inflationary picture.

## St. Lawrence Project

Although Senator Green's (Dem., R. I.) St. Lawrence Seaway and Power Project bill was reported to the Senate floor by the Committee on Foreign Relations on April 28 "without recommendation," the Senate Democratic Policy Committee voted May 13 to place the measure on the Senate program. Chairman Connally (Dem., Texas) of the Senate Foreign Relations Committee vigorously protested against this action, but the insistence of Senator Lehman (Dem., N. Y.) and Moody (Dem., Mich.) and others has prevailed and the issue will be subject to floor debate in the near future.

## Coal Mine Inspection

The Neely (Dem., W. Va.) Coal Mine Safety bill was passed by the Senate on May 7, by a voice vote, with only seven Senators present on the floor. In the House, the McConnell (Rep., Pa.) bill, a more moderate measure, is still under consideration in the Labor Committee following its approval by Rep. Kelly's (Dem., Va.) subcommittee on May 5.

The Neely bill would authorize the Secretary of Interior to (1) issue regulations "necessary to establish safety standards and requirements to be observed in operation of coal mines"; (2) require withdrawal of employes from areas of coal mines where an "imminent danger" is found by Federal coal mine inspectors to exist. It establishes penalties of $2,000 fine, six months' imprisonment, or both, for continued violation of regulations after due notification; and fines up to $10,000, or two years' imprisonment, or both, for violations of a withdrawal order, which is held to be a felony. No direct appeal to the courts provided.

The McConnell bill would authorize Federal coal mine inspectors to close mines where there is "imminent danger" of explosion, fire, inundation, man-trip or man-hoist disasters; also to close mines if operators fail to comply, within reasonable time limits set for correction of Federal Mine Safety Code violations relating to these specific hazards. However, it provides direct appeal by operators of closed mines to the Director of the U. S. Bureau of Mines, or to a Federal Coal Mine Safety Board of Review; appeals may also be taken to Federal courts from rulings of the Director or the Board. Unlike the Neely bill, the McConnell measure carries no broad administration authority for the Secretary of the Interior or the Director of the Bureau of Mines to make regulations, rewrite or originate Safety Code provisions.

## Exploratory Drilling For Uranium Ore

*(Continued from page 44)*

Two to three years ago contract prices for drilling shallow holes were approximately $1.60 to $1.80 per ft. More recent contracts for deeper drilling have been $3.25 to $4.25 per ft. The experience of contractors to date with deeper drilling indicates that these present prices might easily be doubled unless some new drilling practices are developed.

### Lower Costs Possible

New equipment and methods in dry-hole drilling have tended to reduce over-all cost in drilling areas which formerly had to be drilled by diamond drills. If this technological progress is used in conjunction with dry-hole drilling practices, the areas opened up by this cheaper method will become wider and over-all cost will tend to be less. It is a fair assumption that dry-hole drilling will tend to take over all drilling up to 150 or 200 ft in depth. Reductions in cost will allow mine operators, working shallow deposits, to use this tool more closely in conjunction with their mining operations. It is expected therefore that total footage in the carnotite fields with dry-hole methods will reach 2,500,000 to 3,000,000 ft per year.

As the scope of all forms of exploratory drilling increase the attention of all contractors and operators will be drawn more to the Colorado Plateau. It is expected that new developments and practices will help to revolutionize the cost of exploratory work for the industry.

## Suspension Roasting Process

*(Continued from page 39)*

modern plant, be also of a small order and should not exceed about 0.2 man hours per ton of concentrate roasted.

Power consumption of Trail has averaged 24 kwh per ton of concentrate roasted. In other plants treating coarser zinc concentrates, more grinding would be required, and the power consumption would probably be of the order of 40 kwh per ton of zinc concentrates roasted. For iron sulphide concentrates, or pyrites, the grinding requirements would be less and power consumptions of the same order as at Trail, or about 24 kwh per ton, would be obtained.

### Method Is Versatile

It has been established experimentally that the process can be used successfully without the use of extraneous fuel for the roasting of other mineral sulphides, such as lead concentrates, copper concentrates, copper mattes and antimony sulphides, with the production of gases rich in $SO_2$ and the efficient recovery of waste heat from the gases.

The process has also been successfully used for the calcination, or re-oxidation, of iron oxide catalyst, and for the decomposition of manganese sulphate by the use of supplemental fuel.

Essentially, the process should be applicable to practically all roasting or calcining operations, with the use of supplemental fuel where necessary, and should yield all the advantages obtainable from high capacity rates, low labor requirements and efficient steam recovery.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The rumormonger is himself an evil, but only a monkey seals his lips against reality. And cancer is a grim reality. We must discuss the facts of cancer in order to help educate and protect our neighbors. For humanity's sake—and our own preservation—we must support the crusade against this mortal enemy of man.

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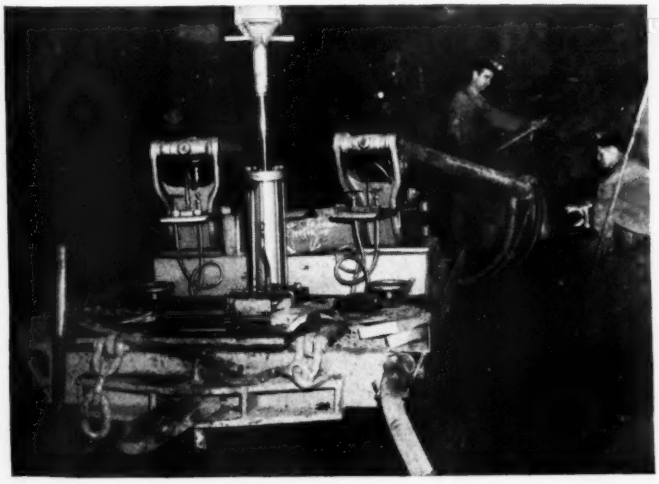

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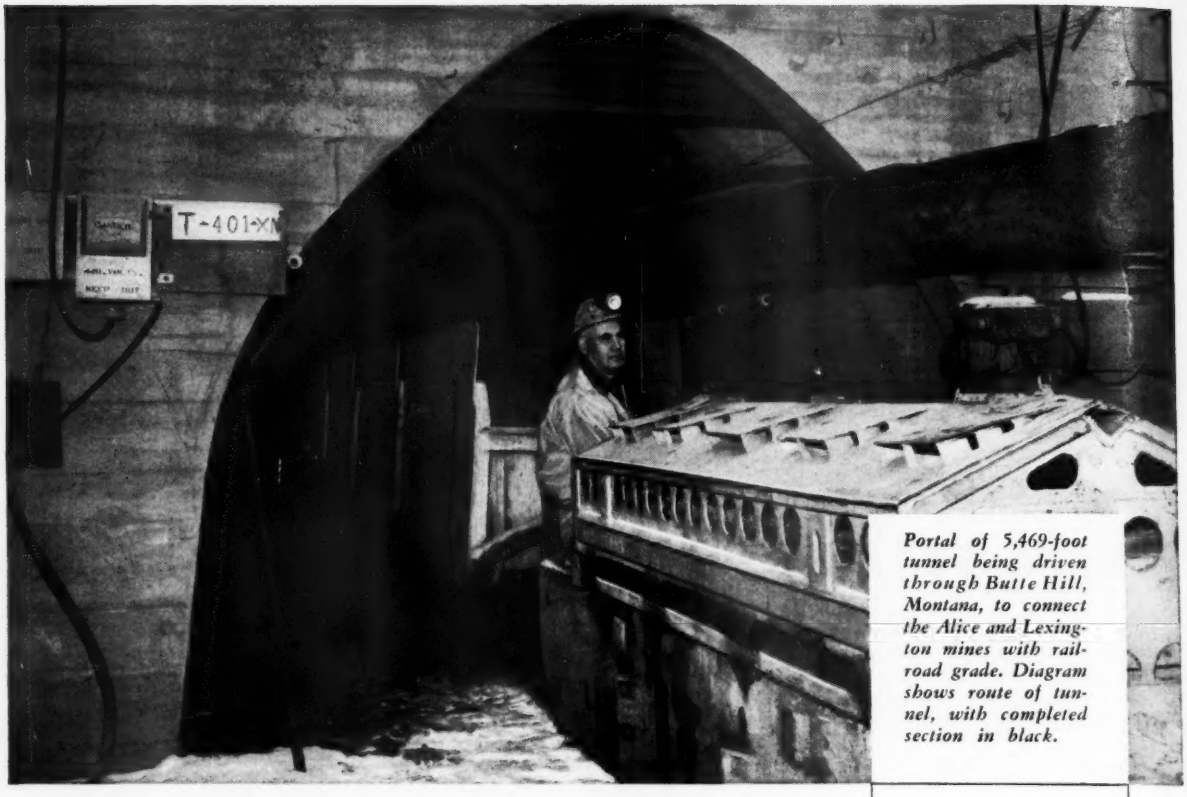



*Portal of 5,469-foot tunnel being driven through Butte Hill, Montana, to connect the Alice and Lexington mines with railroad grade. Diagram shows route of tunnel, with completed section in black.*

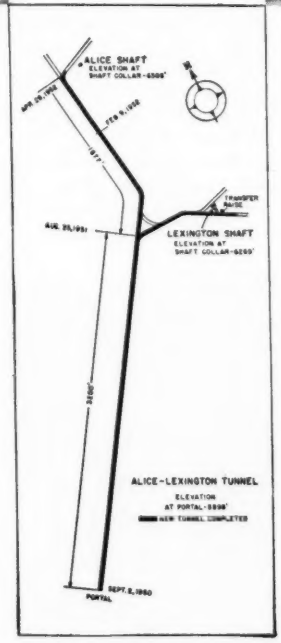
# Digging into YESTERDAY for more ZINC today

Anaconda's historic Alice and Lexington mines on Butte Hill were rich in silver 75 years ago. Today they are being mined for their wealth of zinc—as part of Anaconda's program to increase the capacity to produce from the Company's own mines. The new tunnel, which is now nearing completion, links the two shafts to railroad grade and greatly facilitates the mining operation through improved ore handling.

To handle the increased ore production from the Butte district, the Company is expanding its concentrating and electrolytic plants at Great Falls and Anaconda, Montana. This expansion includes installation of additional crushing, milling and flotation equipment—added leaching units—and new Cottrell treaters to reduce dust losses at the zinc roasting furnaces.

In 1951, Anaconda turned out 62% of all electrolytic zinc—and 23% of all slab zinc—produced in the United States. Within the next few years, the Company's accelerated zinc program will increase Anaconda's mine output capacity by an estimated 50%.

This zinc story is just one part of Anaconda's continuing program of expansion, improvement and modernization—at mines, mills and fabricating plants. Today the program is producing more metal and finer metal for America's strength. Tomorrow it will mean better products and better living for America's people.

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# AMC Personals

**Charles E. Walker** has been elected executive vice-president of the Jewell Ridge Coal Corp. effective June 1, 1952, according to an announcement by Dr. Huston St. Clair, president of Jewell Ridge. Formerly general manager of operations for Island Creek Coal Co. and Pond Creek Pocahontas Co., Walker was more recently manager of the West Virginia operations of Truax-Traer Coal Co.

**George M. Humphrey**, president of The M. A. Hanna Co. for the past 23 years, was elected chairman of the board and chief executive officer of the company by directors at their annual meeting, held May 5.

The directors also named **George H. Love**, president of Pittsburgh Consolidation Coal Co., vice-chairman of the Hanna board; **R. L. Ireland**, for many years a Hanna vice-president, chairman of the executive committee; and **Joseph H. Thompson**, a vice-president and chief administrative officer.

**James Prendergast, C. N. Osborne,** and **J. N. Sherwin** will continue as vice-presidents, and **G. W. Humphrey** was also elected a vice-president by the directors.

**Arch J. Alexander**, chief, West Virginia Department of Mines, was dismissed by Governor Okey L. Patteson on the eve of the recent primary elections in West Virginia. **Joseph Bierer**, administrative assistant in the department, was named acting director until a new chief is named.

**Irving S. Olds**, having reached the corporation's retirement age, has retired as chairman of the board of directors of United States Steel Corp. and has been succeeded as chairman by **Benjamin F. Fairless.**

Fairless, who was named the chief executive officer of the corporation, will continue to serve as president of the corporation, a position he has occupied since January 1, 1938. He will also continue as president of United States Steel Co., the steel operating subsidiary whose main office is in Pittsburgh.

Following his retirement, Olds will resume the active practice of law with the New York law firm of White and Case, of which he has been a member since 1917.

**P. R. Paulick**, consulting engineer, has been engaged by the French Government to visit, survey and report on the French coal mining industry. He has done similar work in China and Formosa in 1948 and in Japan in 1949.

**Sergi E. Zelenkov**, formerly superintendent, American Smelting and Refining Co., Leadville, Colo., has been transferred to Peru where he will be manager of operations of the Northern Peru Mining and Smelting Co.

**Dr. Allen V. Astin**, Government scientist who helped to develop the proximity fuses used in World War II has been nominated by President Truman to be director of National Bureau of Standards. Astin has been serving as Acting Bureau Director since last October, when Dr. Edward U. Condon resigned to take a job in private industry.

**John Gray**, formerly general mine foreman at Copper Cities Mining Co., Miami, Ariz., assumed the duties of mine superintendent at Castle Dome Copper Co. on May 1. **Maynard M. Stover**, formerly drilling and blasting foreman, was named to fill the vacancy created by Gray's transfer. Both companies are subsidiaries of Miami Copper Co.

**George Roberts**, division superintendent, Johnstown Division, Bethlehem Mines Corp., retired June 1 after 54 years in the coal mining industry, the last 25 of which were spent in the employ of Bethlehem. During his long career he had worked a number of seams in three different states.

Roberts is succeeded by **R. H. Ross** who has been with Bethlehem since 1924, in various supervisory capacities, the last ten years as assistant superintendent of the Johnstown Division, comprising Rosedale No. 72 and Franklin Nos. 73 and 74 mines.

**John Brophy**, Marysville, Mont., was named president of the Last Chance Gulch Mining Association at the annual meeting in Helena. Others named to office were **Jack Nichols, Herbert Obendorf, C. R. Brazier** and **Hugh K. Gaw.**

**Holly W. Spahr**, vice-president, Pocahontas Fuel Co., Inc., New York, and **Samuel W. Zagaria**, controller, Truax-Traer Coal Co., Chicago, have been elected to membership in the Controllers Institute.

Established in 1931, the Institute is a non-profit organization of controllers and finance officers from all lines of business-banking, manufacturing, distribution, utilities, transportation, etc.

**Forrest T. Moyer**, chief, Accident Analysis Branch of the U. S. Bureau of Mines, has resigned to accept a position in a different government agency.

**S. E. Hollister**, associated with the Southwestern Engineering Co. of Los Angeles for the past 25 years, has been granted an extended leave of absence to go to Japan.

In Japan, Mr. Hollister will serve as Mining and Metallurgical Consultant to **Clyde Bruce Aitchison, Jr.**, who has extensive mining interests there and in other districts in the Orient.

**George R. Watkins** has been appointed general manager of U. S. Fuel Co. according to an announcement by W. C. Page, vice-president of the company. Watkins became assistant to the vice-president and general manager on March 1, 1951, and on October 1, 1951, was appointed acting general manager.

**Frank Jones** of the Idaho Assay office has accepted a position with Combined Metals Reduction Co. at Caselton, Nev.

**Gregory S. Devine** has been elected a vice-president of Truax-Traer Coal Co. but will continue to head Binkley Coal Sales, A. H. Truax, president, announced recently. Binkley Coal Co. was acquired by Truax-Traer in June, 1950.

Devine has spent his entire business life in the coal industry, having joined Binkley Coal 19 years ago. He is a director of the Illinois Coal Producers Advisory Association and of the Indiana Coal Trade Association.

Resigning as Territorial Commissioner of Mines for Alaska, **Leo H. Saarela** has accepted the position of Regional Mining Supervisor for Alaska in the U. S. Geological Survey. This is a newly created post. In his new headquarters at Anchorage, Saarela's duties will be centered around the administration and supervision of mineral leases in the Alaskan territory.

**E. P. Humphrey,** vice-president of Westmoreland Coal Co., has announced that on June1, 1952, **E. F. Miller** replaced Milo W. Summers as vice-president of the company's Hampton Mines at Madison, W. Va.

**C. A. Pratt,** vice-president of the Western Mineral Products Co., Minneapolis, was named president of the Vermiculite Institute of Chicago, an international trade association of vermiculite processors.

According to a reliable source, **John D. Battle** will retire from his post as executive vice-president, National Coal Association, on July 1. He will not, however, retire from active participation in the association but will be named to a newly created position of assistant to the president. Battle's successor as executive vice-president will be selected at a meeting in Washington called for June 17.

**James T. Towne** has been appointed assistant to the vice-president, Vanadium Corporation of America. He was formerly administrative assistant to the director of the research and engineering department of Air Reduction Co.

**F. P. Diener,** chemical engineer, Universal Atlas Cement Co., New York, has been appointed director, tests and research in the New York office of the company. He succeeds the late George L. Lindsay.

**Norwood B. Melcher,** mineral economist and commodity specialist with the Bureau of Mines for more than ten years and widely experienced in the ferrous metals and alloys field, has been appointed Chief of the Ferrous Metals and Alloys Branch of the Bureau's Minerals Division, Secretary of the Interior Oscar L. Chapman announced on May 22. He succeeds **Robert H. Ridgway,** who resigned on March 18.

## —*Obituaries*—

On May 21, **Walter G. Crichton,** vice-president of the Johnston Coal and Coke Co., died in Charleston, W. Va., at the age of 64. Mr. Crichton was also president of the Crichton Engineering Co. During NRA, he was a chairman of the Smokeless Coal Coke Authority and served as managing director of District 7 Board under the Bituminous Coal Commission.

**Samuel B. Goldberg,** 55, well known mining engineer, died in Salt Lake City recently of a heart ailment. He was graduated from the University of Minnesota and the University of Arizona, and worked as a mining engineer for the American Smelting and Refining Co., in Canada, Peru, Mexico, the Philippines and in this country.

**Charles P. Weir,** retired, died in mid-May at the age of 86. Until a year ago Mr. Weir was superintendent of the Central Pennsylvania power plant of the Berwind-White Coal Mining Co. He is the father of Paul Weir, mining consultant of Chicago.

**George Lee Lindsay,** Director of Tests and Research, Universal Atlas Cement Co., died on April 24 in New York City. Having worked for Universal Atlas before college and during several vacation periods he joined the company as a chemist at Duluth when he was graduated in 1921 from the University of Minnesota. He served the company continuously in various capacities until the time of his death.

During his long career with Universal Atlas his contributions to the betterment of existing products and development of new ones were outstanding. His achievements along scientific lines were reflected in such products as air entraining cement, oil well cement and many other specialty products.

**P. G. Spilsbury,** 69, consulting mining engineer for Anaconda Copper Mining Co., died May 3 in Washington, D. C., after a short illness. Spilsbury, a native of Pelham Manor, N. Y., received his engineering degree from Lehigh University in 1905. He operated extensively in Mexico and Costa Rica before going to Arizona in 1917 as consulting mining engineer for Inspiration Consolidated Copper Co. He was widely known in Arizona for his work with the Arizona Industrial Congress, which he founded and headed as president, an organization which worked principally to bring new business into the state. From 1932 to 1936 he served as consulting engineer for The American Brass Co. and Anaconda Wire and Cable Co. in Washington, and from 1936 to 1940 in Los Angeles. Since 1940 he has represented Anaconda in Washington, covering war operations and cooperation with the government in special production of chrome, magnesium, manganese, copper, lead, and zinc, both domestic and foreign.

**Joseph Henry Rodgers,** one of Colorado's leading mining geologists, died in Boulder, Colo., on Wednesday, April 23.

Mr. Rodgers, with his brother, Myron Rodgers, was responsible for the early development of the Hidden Creek Mine, at Anyox, B. C., and the Nickel Plate mine, also in British Columbia.

He had been active in mining in Colorado since 1922, and in Boulder County for the last 15 years. He was one of the owners of the Slide mine, at Gold Hill, and recently he had been interested in a tungsten lease in the Sugarloaf district.

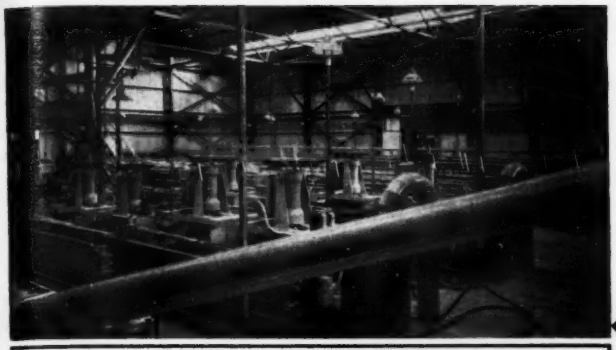
Born in Charleroi, Pa., in 1879. Mr. Rodgers held degrees from the University of Wisconsin and Northwestern University. He was president of the Northwestern Alumni Association of the Colorado region in 1941-42.

He was a member of Sigma Nu, of the AIME, and was active in both the state and Boulder County mining associations.

J. H. Rodgers was the grand old man of Colorado mining, and particularly of the Boulder County mining district. He had the experience and ability to read the rocks as most of us can read a book, simply, directly, and without effort. With a keen interest in any new development in the industry, he was always ready to help and advise on any problem of geology or mining, and generously gave his time and energy to all who asked for it.

**Brad L. Taft,** 79, mine owner and operator in the Pacific Northwest, died recently in a hospital in Seattle. He formerly operated in Snowstorm Mine at Mullan, Idaho, and was Mullan's first mayor.

**Frank H. Woods,** 84, director and president for many years of the Sahara Coal Co., Chicago, died in Omaha, Nebr., while preparing to cast his ballot in Primary Election. A heart attack was listed as cause of death.



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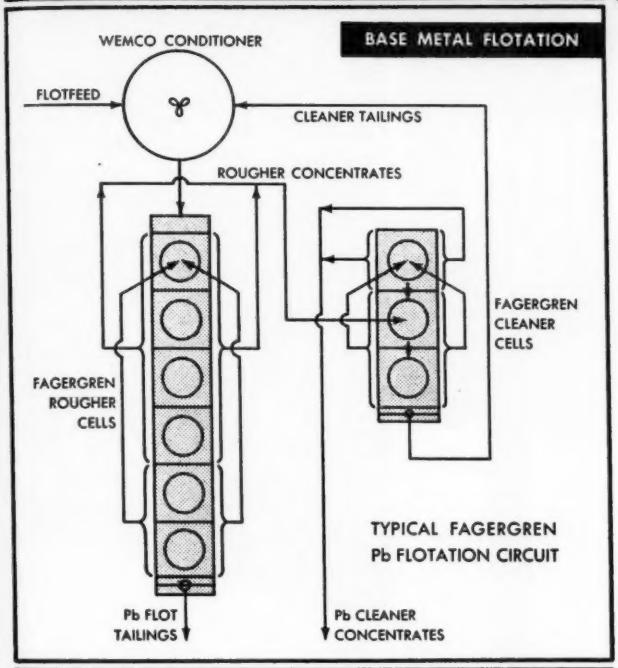


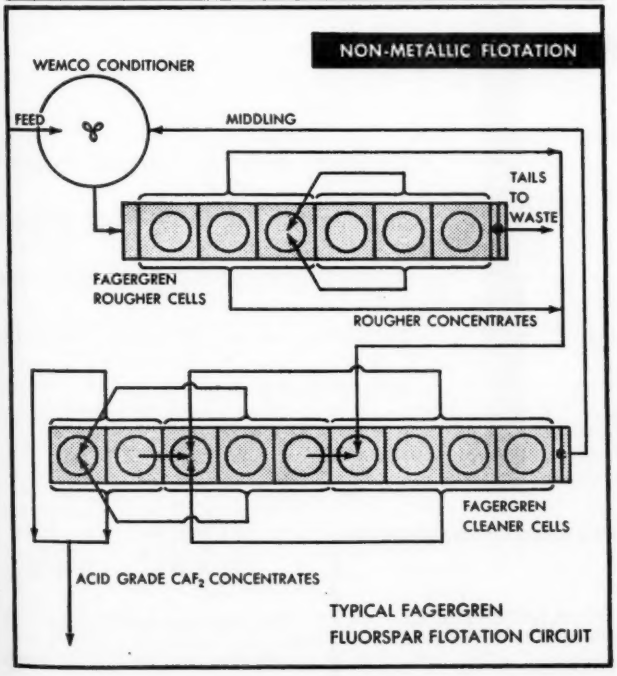


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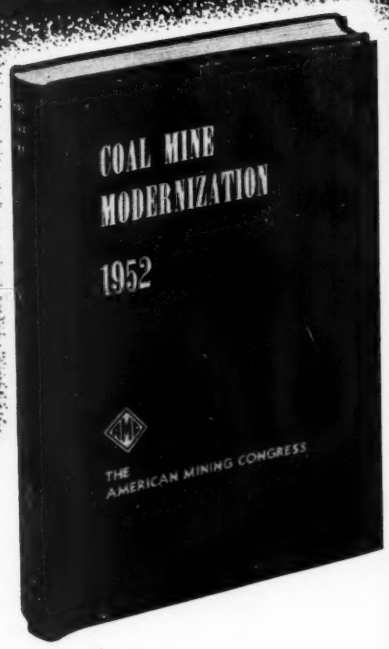
# Coal Mine MODERNIZATION

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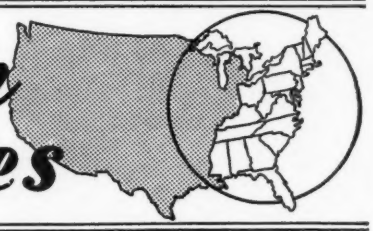
# NEWS and VIEWS

## Eastern States



### Zinc Institute Elects Directors

At the annual meeting of the American Zinc Institute, the following directors were elected for the term ending 1955: W. C. Bennett, Phelps Dodge Refining Corp., New York City; O. W. Bilharz, Bilharz Mining Co., Inc., Baxter Springs, Kans.; H. D. Carus, Matthiessen & Hegeler Zinc Co., LaSalle, Ill.; C. M. Chapin, Jr., St. Joseph Lead Co., New York City; M. L. Havey, New Jersey Zinc Co., New York City; R. G. Kenly, The New Jersey Zinc Sales Co., Inc., New York City; S. H. Levison, American Smelting & Refining Co., New York City; George Mixter, U. S. Smelting Refining & Mining Co., Boston, Mass.; R. F. Orr, Athletic Mining & Smelting Co., Forth Smith, Ark.; and W. B. Porter, Hegeler Zinc Co., Danville, Ill.

### Confer on Coal Research

The second Gordon Research Conference on coal will be held at New Hampton School, New Hampton, N. H., August 25-29. These conferences were established to stimulate research in universities, research foundations, Government and industrial laboratories. Their purpose is achieved by an informal type of meeting consisting of scheduled lectures and free discussion groups. The meeting is off the record and no publications are prepared as emanating from the conference.

The conference on coal covers a wide range of subjects from combustion and gasification reactions to X-ray studies of coal and carbon. The meeting will afford an opportunity for those in the forefront of these fields of research to become acquainted and to exchange ideas.

The committee for the coal conference includes G. D. Creelman, The M. A. Hanna Co., chairman; A. C. Fieldner, Bureau of Mines, vice-chairman; N. K. Chaney, American Gas Association; J. F. Foster, Battelle Memorial Institute, and H. C. Howard, Coal Research Laboratory of the Carnegie Institute of Technology.

Requests for additional information should be addressed to Dr. W. George Parks, Colby Junior College, New London, N. H.

### Safe Foremen Honored

Eastern Gas and Fuel Associates have 398 foremen employed in 21 mines who have supervised their crews from one to 22 years without any member having suffered a lost-time accident, according to latest figures published by the Coal Division's accident prevention department.

The mines and number of foremen in each operation who have made the 1952 Honor Roll are: Beards Fork, 18; Carswell, 21; Eccles No. 5 and No. 6, 20; Federal No. 1, 43; Helen No. 9 and Stotesbury No. 11, 38; Keystone, 32; Kopperston No. 1 and No. 2, 68; Maitland, 11; Melcroft, 24; Page, 4; Powellton No. 6, 13; Sonman, 20; Stotesbury No. 8, 22; Weeksbury, 8; Wharton No. 1, 28; Wharton No. 2, 21.

### The National Apprenticeship Program 1952 Edition

What apprenticeship is, the occupations in which apprentice training is given, how apprenticeship programs are established, the functions of the Bureau of Apprenticeship, U. S. Department of Labor, State apprenticeship agencies and joint management labor apprenticeship committees are explained in this 1952 edition of "The National Apprenticeship Program."

Copies can be obtained free of charge by communicating with the Publications Branch, Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C.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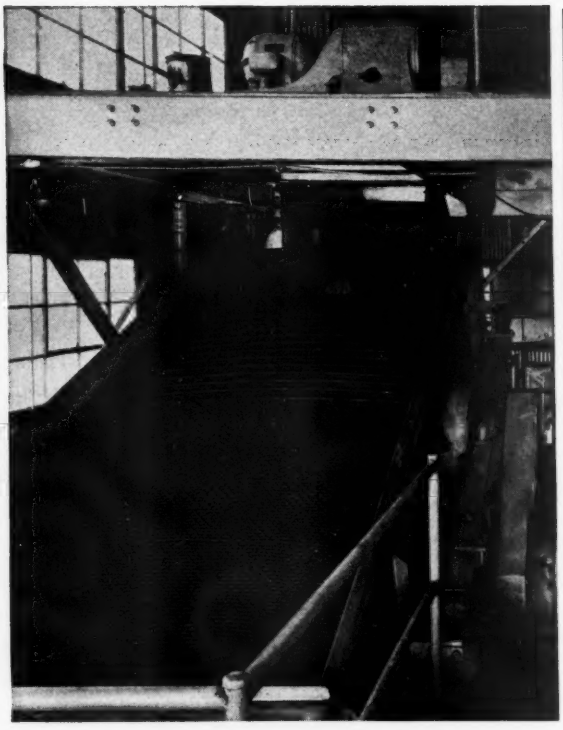

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## Bluefield Show Attracts Many

The 1952 Southern Appalachian Industrial Exhibit was held in Bluefield, W. Va., on May 14-16. Several thousand people connected with the coal mining industry crowded into the Norfolk and Western Railway Freight Terminal during the three-day show to view the exhibits of manufacturers and coal field distributors.

Reigning over the whole affair was Miss Laura Lee Payne, 19-year-old daughter of a mining family in Elkhorn, W. Va. She was crowned Queen Bituminous XI at the opening day ceremonies.

On Friday, the high point of the meeting was reached with the biennial Pioneer Safety Miners Club Reunion. Qualification for the Pioneer Safety Miners Club consists of 40 years or more in the coal mines without a lost time accident. According to latest figures, when the average miner has worked 50 years he will have had nine lost time accidents; so these Pioneer Miners have accomplished no mean feat.

More than 45 members of this club were honored this year by receiving the Joseph A. Holmes "Certificate of Merit," award of the Joseph A. Holmes Safety Association in recognition of 45 or more years in mining without an accident. All of the members received a certificate from the West Virginia State Department of Mines for his services to and in the coal mining industry.

**William E. Dixon was crowned King Safety and awarded the Golden Pick by Fred Bailey for having worked 51 years in a coal mine without a lost time accident. He is still employed by the American Coal Co.**

The group was addressed by B. B. Housman, secretary of the Pocahontas Operators Association; Joseph Bierer, acting chief, West Virginia

Fifty dollars was given to Robert Lee Smith, Stotesbury, W. Va., for his safety record

Department of Mines; E. E. Quenon, U. S. Bureau of Mines and several others. Several of the "oldtimers" spoke before the group of their experiences and reminisced about the "good old days."

Fred Bailey, Cardox Corp., originator and director of the Reunion presented a $50 prize and the title of King Safety to William E. Dixon of Widemouth, W. Va., for having the best safety record for Pioneer Miners still active. Mr. Dixon, 81, is employed by the American Coal Co. He has begun his 51st year without a lost-time accident.

Another $50 prize was won by Larkin C. Ramey of Princeton, W. Va., for having the best safety record of all the inactive white Pioneer Miners present. Robert Lee Smith, Stotesbury, W. Va., won the same prize for the best record of the colored members.

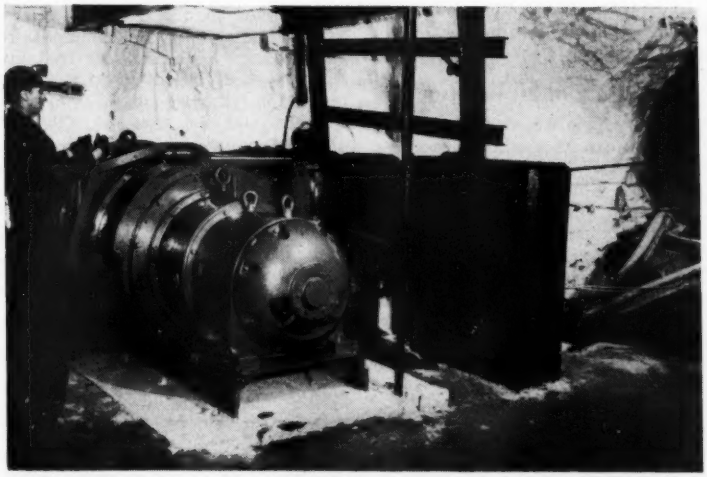
## New Metal Deposits in Canada

Canadian Government Solicitor General Antoine Rivard has announced that new zinc and nickel deposits have been discovered in eastern Canada and will be developed jointly by private industry and the Government. The deposits have been uncovered near St. Fabien, and will be tapped by Government built roads from the main highways to the site of the mine discovery.

## INCO Mine Progresses

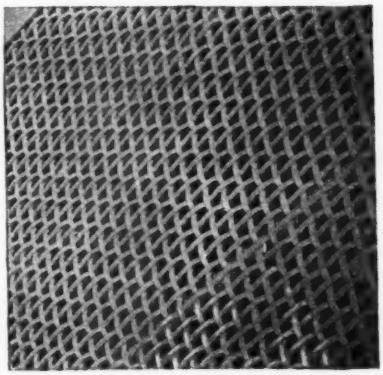
Underground operations of the International Nickel Co. at Copper Cliff, Ont., are going forward rapidly. To date, $130,000,000 have been spent shifting INCO's operations from surface and underground mining to all underground mining. Upon completion of the program, about the end of 1953, the company will be able to hoist 13,000,000 tons of ore a year, or twice as much from underground as in any year prior to 1951. It will then have the largest mining operation of its kind in the world. Whole new areas have been developed for ore production, more than 70 miles of new underground openings have been driven and four concrete lined shafts have been sunk.

Much of the new production will come from block caving. This lower grade ore is being treated in a concentrator at the mine site, with a present capacity of 10,000 tons a day soon to be increased to 12,000 tons a day.



New bulk mining methods developed by International Nickel in the Sudbury District of Ontario have required installation of trainloads of highly specialized equipment. More than 150 of these 125-hp slusher hoists and scrapers have been ordered to drag ore from the stopes of new mining areas to openings leading to ore cars or crushers


HEWITT



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# U. S. Bureau of Mines Holds Coal Research Conference

A CONFERENCE on its coal research and technology program was held by the Bureau of Mines at the Central Experiment Station in Pittsburgh, May 12 to 14, 1952. The meeting was under the general chairmanship of Louis C. McCabe, Chief, Fuels and Explosives Division, with 50 Bureau engineers and technologists and 40 or more representatives of the coal industry and other research organizations in attendance.

The first technical session opened with papers by T. W. Hunter, Chief, Coal Branch, on the use of statistics in planning coal research, and by H. J. Barnett of the Bureau's Washington office on the role of economics in coal research.

Chief Mining Engineer, E. D. Gardner's coal-mining research program was presented. Mining problems in the bituminous and anthracite fields were discussed by J. W. Buch, J. J. Dowd, W. A. Haley and J. D. Cooner for the Bureau of Mines and Joseph Pursglove, Jr, and Max Forester representing the interest of industry in coal-mining research.

A paper on degasification of coal beds in advance of mining, summarizing experiments in the United States and Europe, was presented by L. A. Turnbull and discussed by Paul Price, State Geologist of West Virginia, and others.

Interesting papers on explosives' research and safety research problems in coal mining were given by G. H. Damon and I. Hartmann.

"Physical and chemical properties of coal important in its beneficiation and utilization" was discussed by H. H. Storch, in which the importance of fundamental research in coal was emphasized.

## Sampling Pays Off

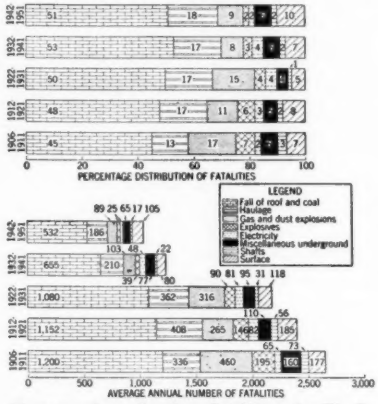
Coal sampling and analysis by the Bureau in connection with Government purchases of coal were described by J. F. Barkley and R. F. Abernethy. This activity, plus fuel economy service and consulting service on boiler-feed water conditioning, it is estimated saved the Government, in purchases and efficient use of coal, over $30,000,000 a year which is more than the yearly appropriation to the Bureau.

The importance of special analyses and coal petrography was emphasized by W. A. Selvig, B. C. Parks, and W. H. Ode. Aside from purely scientific interest, there is the possibility of recovering valuable elements, such as germanium from coal ashes and the other possibility of locating mineral deposits in neighboring rocks through the concentration of such elements in coal and coal ashes.

The role of the Bureau's foreign work, Region IX in the coal program, was described by Alan Probert.

The panel on the coal-preparation program included T. Fraser, H. F. Yancey, B. W. Gandrud, W. L. Crentz, J. D. Clendenin and R. C. Ellman, who discussed coal preparation problems in the northern Appalachian Region, the Northwest, the Dakotas, Alabama and the anthracite region of Pennsylvania. J. B. Morrow, consulting engineer, called attention to the desirability of conducting fundamental research on flotation of fine coal to remove sulfur.

The coal-carbonization program was sparked by F. W. Smith, V. F. Parry, W. S. Landers and J. B. Gayle. The emphasis again was on fundamental research on the carbonization of eastern coals. In connection with North Dakota lignite, A. C. Burr gave a comprehensive talk on lignite reserves and outlined plans for future investigations at the Lignite Research Laboratory at Grand Forks, N. D.




**Causes of coal mine fatalities in U. S., 1906-1951**

## Coking Coals Wasted

Progress of the Bureau's investigation of "known recoverable reserves of coking coal" was briefly summarized by J. J. Dowd and J. J. Wallace. Max Forester, Pittsburgh Consolidation Coal Co., called attention to the fact that upgrading of inferior quality coking coals is being practiced, and at the same time, large quantities of superior-grade coking coal are being used for heating and steam raising for which poorly coking coals and low-grade coals could be utilized.

A very interesting session was devoted to problems in the utilization of coal. J. Jonakin outlined the proposed program of the Bureau in combustion research. Two special studies now under way, "Gob Pile Fires" and "Incineration," were discussed by E. G. Graf and R. C. Corey. Suggestions and discussions of coal utilization problems were made by E. Kaiser, J. Blizard, H. F. Hebley, T. C. Cheasley, B. Landry, and R. M. Hardgrove.

The importance of additional research on gasification of coal was emphasized by L. L. Newman, and Bureau experiments on gasification of North Dakota lignite were explained by W. H. Oppelt. E. P. Carman presented a paper on the development of the coal-burning gas turbine and its adaptability for power generation, especially in the arid regions of the west where water for steam-generating plants is not available.

A. C. Fieldner spoke on the importance of cooperative research with industry and cited several cooperative problems both completed and now in progress that have been of great benefit to industry as a whole. The final session was brought to a conclusion with a summary of the conference by R. L. Brown.

## Coal in Short Supply by 1980

A high light of the conference was a roast-beef dinner at Hotel Webster Hall. H. P. Greenwald was Toastmaster, and the diners enjoyed a short talk by J. J. Forbes, Bureau Director, who took this opportunity to present, posthumously, the Department's distinguished service award and gold medal for Albert L. Toenges to his son, Ben H. Toenges. The principal speaker at the dinner was Eugene Ayres of the Gulf Research and Development Co., who estimated that by 1980 the peak of coal production in the Eastern Province will be reached at 600,000,000 tons, and at that time the demand for electric-power generation alone will be 500,000,000 tons a year. Add the coking coal required for steel making and other demands, and by 1980, or perhaps before, the coal mines in the Eastern Province will not be able to meet demands. This will require movement of coal from west to east. Some method of transportation cheaper than by railroad freight will be required. Research to develop other methods of transporting coal over long distances could well be undertaken now.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## To Build HMS Plant

The Woodward Iron Co., Birmingham, Ala., has awarded a contract for the largest heavy media separation plant to date in the U. S. A. It is expected to have a capacity of 300 tph. Primary purpose of the separator is to sort out a siliceous parting in the main iron ore seam.

## Iron Ore Ahead of Schedule

Recent reports indicate that iron ore from Labrador and Quebec is expected to start moving to steel mills by the summer of 1954, a year ahead of schedule.

According to Jules R. Timmins, president of Hollinger Consolidated Gold Mines, Ltd., Labrador Mining and Development Co., Ltd., and vice-president of Iron Ore Co. of Canada, construction of the 190-mile railway which will haul the iron ore to market is proceeding on schedule.

## Pipe Coal From Face

A new project which may lead to big changes in methods of coal mining and distribution is now under way at the National Coal Board's central research establishment in Britain. It is based on the principle of grinding all coal to powder at the coal face, pumping it to the surface in water, and perhaps distributing it by pipeline to industrial areas.

The NCB research establishment at Stoke Orchard in Gloucestershire has a staff of 250 scientists, technicians, and engineers whose work extends to fundamental research, i.e., in chemistry and physics, as well as to below-and above-ground technical research development.

## Establish Cement Scholarship

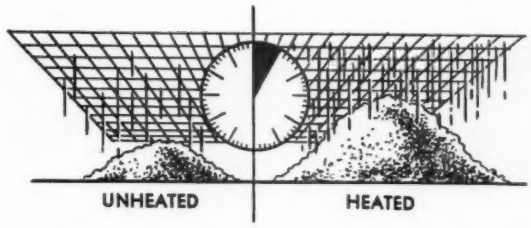
Lehigh Portland Cement Co., Allentown, Pa., with a gift of $15,000 has established and endowed an undergraduate scholarship at Princeton University open to any qualified student in any one of the university's department of studies. The fund will be known as "Lehigh Portland Cement Co. Scholarship" and will return sufficient annual income to cover the full cost of an undergraduate's tuition for an academic year. There is but one stipulation in making awards for this scholarship: that it be used solely and exclusively for providing tuition for undergraduate students in the engineering or liberal arts departments.

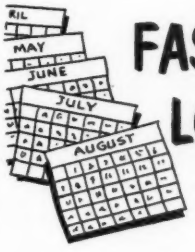
## Want Mine Inspectors

The United States Civil Service Commission has announced an examination for Coal Mine Inspectors for filling positions in the Bureau of Mines, U. S. Department of the Interior, located in the various coal mining sections of the United States. The salaries range from $5,060 to $7,040 a year.

No written test is required. To qualify, applicants must have had progressive coal mining experience. Part of the experience must have been in a position of at least the responsibility of a mine superintendent, mine foreman, mining engineer, or safety inspector or engineer and must have involved the responsibility for providing modern coal mine safety and health programs. Successful completion of college courses in engineering may be substituted for part of the experience. Applicants must be able to drive an automobile. The maximum age limit is 48 years.

Full information and application forms may be secured at most first- and second-class post offices, from Civil Service regional offices, or from the U. S. Civil Service Commission, Washington 25, D. C. Applications for this examination will be accepted by the Executive Secretary, Board of U. S. Civil Service Examiners, Bureau of Mines, Department of the Interior, Washington 25, D. C., until further notice.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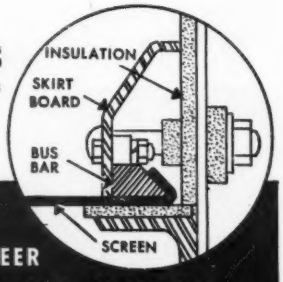


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## Slope Sinking

*(Continued from page 35)*

down by methods similar to those mentioned above to meet the slope being driven up. Loading of the muck was done with an 11 BU loading machine. To keep the machine from crowding into the face too fast a Brown-Fayro car puller was set 100 ft back from the face with the rope tied to the bumper of the loading machine. The machine helper used a pull-cord switch at the face to operate the hoist. Muck was loaded into a track-mounted 42 D shuttle car, which was pulled to the outside by a temporary hoist with 100 hp motor. The muck was dumped into a 75-ton rock bin set so a truck could back under it to receive its load.

Timbering and drilling while driving down the slope were done in the same manner as driving upward. In going down, roof bolts were used where there was good rock in which to anchor. The bolts were put on four-ft centers, which made six bolts across the face. This prevented overbreak in the top.

Immediately after leaving the caissons, a sump three ft deep was dug on the south side of the slope and a concrete ditch poured across the slope to catch the surface water that came down. In driving up and down, very little water was encountered.

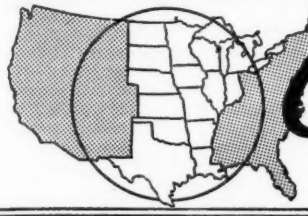
The upper and lower portions of the slope holed through on January 12, 1952, 778 ft from the coal level and 465 ft from the portal.

## Plan Slope Belt

The 48-in. steel cable reinforced belt to move the coal up the slope will be 1729 ft between centers, with a vertical lift of 476.5 ft and a speed of 475 fpm. It was decided to use three 250-hp motors connected to a tandem drive placed on the ground surface at the portal, rather than one large motor drive for this belt. This would eliminate construction of a heavy support for the drive and also make installation and repairs easier.

A belt splicing and repair housing will be built along the belt structure just above the drive, to provide a convenient and safe place in which to work. To reduce belt abrasion the coal will be fed out of the bottom of the 1000 ton bottom hopper and placed on the belt with two Syntron feeders and a speed-up belt 48 in. wide, 47 ft between pulleys.

By planning and timing so several phases of the work could be done concurrently, it was possible to complete the shaft and slope in 12 months, drive development entries and at the same time obtain revenue from coal mined during the construction period.



# Central States

## Build R.R. to Copper Mine

The Duluth, South Shore and Atlantic Railroad will build a 14-mile spur track from its main line at Bergland, Mich., to the White Pine copper mine of the White Pine property of Copper Range Co. Henri S. Mitchell, president of the railroad, made this announcement recently. The new track is to be in operation by late fall so that heavy construction material can be moved to the mine and townsite.

## Strip Fishing Pays Off

Fish caught in waters formed as a result of strip coal operations in the state of Missouri are the basis for a contest being sponsored by the Missouri Coal Operators Association. The grand prize in this third annual Missouri Strip Pit Fishing contest is a five-hp Mercury outboard motor. Among the other 112 prizes are valuable rods and reels for the winners. The contest is open to all fishermen and a duplicate set of prizes is offered to coal company employes and the general public.

Official rules and entry blanks may be had by writing to Tom Cheasley, secretary, Missouri Coal Operators Association, 114 W. 11 St., Kansas City, Mo.

## Study Taconite Concentration

G. V. Woody, manager of the processing machinery department, Allis-Chalmers Manufacturing Co., has announced plans for a pilot plant for pelletizing and heat hardening taconite concentrates.

Warning that a great deal of testing remains to be done before the commercial feasibility of continuous heat hardening of taconite pellets can be determined, Woody pointed out that the pilot plant, a cooperative undertaking with the Arthur G. McKee Co. of Cleveland, is the only way to make certain that successful laboratory results will be borne out in practice.

The plant, being built at Carrollville, Wis., 14 miles south of Milwaukee, is expected to process one to two tons per hour of concentrated taconite fines brought in by rail from the Mesabi Range.

Pelletizing will be done in a balling drum and the "green" (soft) pellets predried in a rotating drum prior to being fed to the traveling grate. During the travel on the grate, the green pellets will be further dried, preheated, ignited, and burned. Waste heat from the grate is utilized in the drying and preheating stages to reduce fuel consumption.

The pilot mill will also permit further study of such problems as heat hardening of both magnetite and hematite concentrates without admixed carbon, according to Woody.

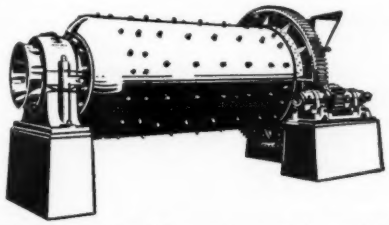
It is planned that the product from the unit will be shipped to a blast furnace for test in actual iron production.

## To Reopen Tinton Mine

It was announced by the Maywood Chemical Works of Maywood, N. J., that the Black Hills Tin Co. mine will be re-activated. Negotiations between the two companies have been completed. The mine and concentration mill are scheduled to resume full-scale operations for producing spodumene ore concentrates and related minerals. The mine is located at Tinton, S. D. Renewal of operations is due to the present heavy demand for lithium products. Maywood Chemical Works has been mining spodumene at Keystone since 1906. Facilities are said to be in good condition at Tinton, after a two-year shutdown. Both underground and open pit mining are practiced.

## New Ore Showings

The first significant looking ore at depth has been encountered in two drill hole sections at the mine of the Hudson Bay Mining and Smelting Co. The company has a mine at Flin Flon, Manitoba, which produces gold, silver, copper and zinc.

WHAT HAPPENS INSIDE A ROD MILL?

The answer to this controversial question is thoroughly covered by Hardinge in Bulletin 25-C-52 (recently published) on the subject of rod mills, their proper field of application, and specifically—how Hardinge Rod Mills solve some of the usual problems.

*Write for Bulletin 25-C-52*

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## Aid to Future Farmers

Four scholarships for high school seniors who are members of 4-H Clubs or the Future Farmers of America will be awarded each year by the Plant Food Division of International Minerals & Chemical Corp. beginning in the fall of 1952, according to Maurice H. Lockwood, vice-president in charge of the division. Each scholarship will provide a grant of $300 for vocational training or special courses at any accredited institution. It will not be renewable.

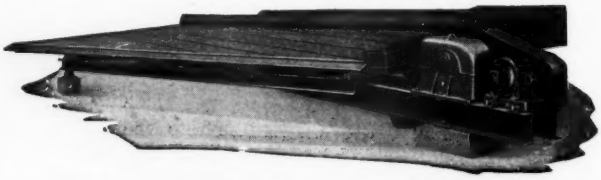
Mr. Lockwood also announced that two scholarships each year will be awarded to employes, or the sons or daughters of employes, of the Plant Food Division. Each of these scholarships will provide a grant of $600 a year, renewable annually for a full four-year course in any accredited institution of high learning.

All the awards will be made on the basis of superior scholastic performance, high character, leadership ability and relative financial need.

For several years International Minerals & Chemical Corp. also has awarded four other scholarships. Each is in the amount of $600 a year, renewable for a four-yr course. One is available to employes or the sons or daughters of employes of the company's Florida Phosphate Division; one to high school seniors in Polk County, Fla., in which the Florida Phosphate Division is located; one to employes or the sons or daughters of employes of the potash mine and refinery operated by the company's Potash Division at Carlsbad, N. M.; and one to high school seniors in Eddy County, N. M., in which the potash operations are situated.

## AEC Seeks Men

**The U. S. Atomic Energy Commission needs experienced geologists in its Division of Raw Materials in both domestic and foreign positions. Salaries—$5,060 (GS-9), $5,940 (GS-11), $7,040 (GS-12), and $8,360 (GS-13), depending on experience. Minimum experience three years. Civil Service status not required. Those interested should write to U. S. Atomic Energy Commission, 70 Columbus Avenue, New York 23, N. Y., Attention Mr. Robert D. Nininger, Division of Raw Materials.**

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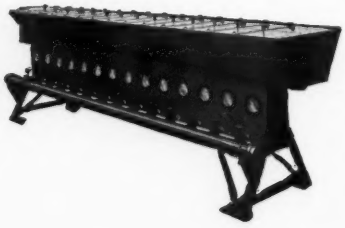
**The reduction of wear and tear on the re-circulating equipment, the time-proved anti-friction bearing head motion, the low current consumption, the factory-aligned underconstruction and the long-life deck covering and riffles all effect economies that add up little by little throughout the operating year to total savings that further explain why SuperDutys have figured in most important table installations of recent years. For full information, write for Bulletin 118B.**



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## Coal Company Celebrates

Sinclair Coal Co. of Kansas City, Mo., America's largest producer of surface-mined coal, is celebrating its 50th Anniversary.

In operation for a half century, Sinclair has experienced its greatest growth since 1927. In that year, their one Oklahoma mine produced only 7000 tons of coal. In 1951, production was just under 10,000,000 tons. In ten years (1941-1951) the company has progressed from 36th to 6th in total coal tonnage.

## Lead Company Considers Oil

St. Joseph Lead Co. is considering a proposal to go into the oil and natural gas field according to recent proxy to stockholders calling a special meeting of shareholders for June 16.

Under the proposed amendment to the Certificate of Incorporation, St. Joseph Lead Co. will be permitted to conduct mining operations of all kinds —"to explore for, develop and deal in any natural resources of any kind." This, of course, would include minerals, ores, metals, oil, natural gas and other substances.

The company disclosed that a possible opportunity has been presented to the management to acquire a substantial interest in certain oil, gas and mineral leasehold rights now owned by a responsible oil company in lands in various states.

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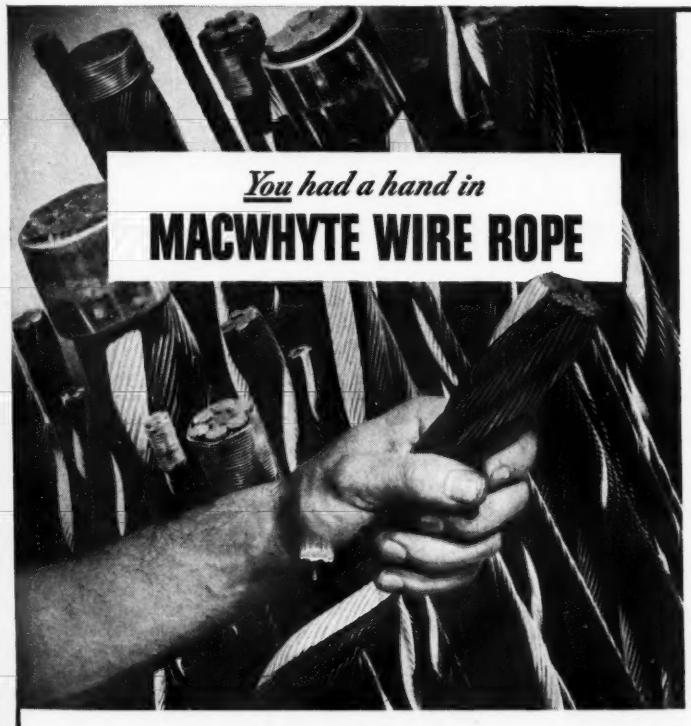


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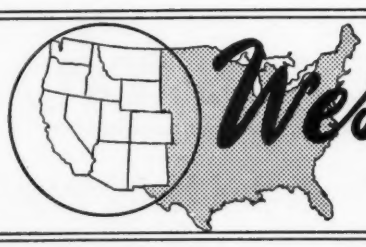

# Western States

## Extend Open Pit Operations

Inspiration Consolidated Copper Co., Inspiration, Ariz., is extending the use of open-pit methods of mining to a third area of its ore body. For the past four years, Inspiration has been working two separate truck pits—the Live Oak and the Colorado—producing 6000 tons of one percent copper ore daily. Total production in 1951, from underground and open-pit operations, was 78,249,439 pounds of copper from 4,026,422 tons of ore averaging 1.019 percent copper to the ton.

## California Dredges Busy

Five Yuba Consolidated Gold Fields dredges are working steadily in the Yuba River, east of Marysville, Calif. The largest works to depth of 124 ft below the water line and drill holes have failed to locate bedrock at a 250-ft depth. Much of the placer grounds are covered with debris washed down by hydraulic mining operations in the early days of the region, which necessitates deep dredging to reach virgin gravel. Some dredges are handling more than 500,000 cu yd of material monthly. Portions of the company's holding near Hammonton are being redredged and gravel exposed by diverting the Yuba River from its channel is also being worked. In addition, Yuba is operating two dredges between Biggs and Oroville on the Feather River and another near Chico.

## Uranium Properties

Kerr-McGee Oil Industries, Inc., has acquired the mining properties and equipment of the Navajo Uranium Co. in New Mexico and Arizona. The properties include the uranium sampling and ore-buying depot at Shiprock, N. M., recently opened to provide a market for ore produced by Navajo Uranium and other uranium ore producers in the Lukachukai Mountain region of the Navajo Indian Reservation in northeast Arizona. Principal owner of the Kerr-McGee firm is Senator Robert S. Kerr of Oklahoma.

Dean McGee, executive vice-president of the company, said the amount of uranium mined by the Navajo Uranium Co. is secret but that the installation probably "represented one of the country's most important sources of uranium." The new owner plans to increase production of the mines and to locate new reserves of uranium ore. Navajo Uranium Co., has been negotiating with government agencies concerning the construction of a uranium ore processing plant at Shiprock to treat the ores weighed in at the purchasing depot. Mr. McGee said that his firm will continue "engineering investigations in such connection."

## Files Placer Claims

In southern Fremont County, Wyo., Charles Rudolph, Wamsutter, Wyo., in his own and other persons' behalf, has filed 100 placer claims covering 16,000 acres in the area where uranium was discovered Nov. 18, 1951. The claims lie in sections 17 through 35. Each claim filed comprises 160 acres and gives the title holder sole rights for further exploration and production.

## Work at Atlas Shaft

The Hecla Mining Co., in joint ownership with Newmont, New Jersey, Zinc and Atlas mining companies, has now completed preparations for sinking the Atlas shaft at Mullan, Idaho, from the 800- to the 2400-ft level. A 450-hp hoist has been installed, the main adit tunnel enlarged to the shaft collar and a larger skip pocket constructed. A Riddell clamshell dipper, first used in the district by Hecla at the Rock Creek and Silver Summit operations, will be used in the work.

## Butte Miners Day Set

The Butte Civic Center will be the scene on June 13 of the annual Butte Miners Union day celebration. The traditional celebration, which this year marks the 74th anniversary of the founding of the union, has for many years been held at the Columbia Gardens. This year, however, it was decided to take advantage of the splendid facilities of the new civic center.

Plans for the event include the annual first aid contest, sports program and speaking program, concluded by a dance. The first aid contest is sponsored by the Bureau of Safety of the Anaconda Copper Mining Co., which offers prizes for winning teams. Each of the operating mines on the Butte hill are expected to enter one or more teams in the annual event.


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## Coal Land Lures Top Bids

Kaiser Steel Corp., and Minerals Development Corp., controlled by the Godfrey L. Cabot, Inc., carbon interests, have acquired leases on extensive coking coal reserves following bidding in Salt Lake City on 4286 acres of Federal coal lands 20 miles northeast of Price, Utah. Kaiser Steel outbid Minerals Development on a 1760 acre tract near Kaiser's Sunnyside mine holdings. Final bid was a flat $10,000 in bonuses for the entire tract. Minerals Development was unchallenged on a bonus bid for leases on 2565 acres of coal lands at a somewhat greater distance from Kaiser's Sunnyside area. This larger tract is adjacent to Minerals Developments' 640 acre lease on which considerable diamond drilling has been done in the search for coking coals.

Both leases run 20 yrs and both firms are committed to carry out certain minimum development work within the next three years. Kaiser Steel must spend $100,000 during that period and Minerals Development $150,000. The government is to receive 15 cents a ton royalty from any production from the properties. Minerals Development plans diamond drilling and other exploration activities according to an official of the company.

## Arizona Asbestos

The Western Chemical Co. is milling approximately 100 tons of asbestos ore in its recently constructed mill at Chrysotile, Ariz. Present tonnage is from the extensive dumps left from very early operations. W. D. Cluff of Los Angeles heads the organization and Frank Witty, Globe, Ariz., is company manager. The company recently acquired the idle asbestos holdings of Johns-Manville Corp., a group of 88 claims in the McMillan Mining District, 30 miles east of Globe.

## Yolo Plans Operations

The Yolo Steel & Metal Co. has leased a 500-acre property from the Shasta Mining Co. and plans to operate the mine as an open pit with power shovels. The property is located near Redding, Calif., on the Pit River, close to Lake Shasta and is credited with high grade iron deposits. About 90 men will be employed on the project. Ore will be carried across the lake on barges to the Southern Pacific Railroad for shipment.

Yolo has leased other iron deposits in Madera and Shasta Counties containing 16,000,000 tons of iron ore, and is currently studying iron deposits in Lassen and Plumas Counties in California. The company has also leased coal properties in Wyoming. The Shasta properties were worked during both World Wars.

**Denver's City Hall in the beautiful Civic Center will be a landmark for Mining Show visitors**

# Denver Plans Rolling

WHILE mining men all over the country are turning the pages of this issue of MINING CONGRESS JOURNAL to find out how plans are progressing for the greatest Metal and Nonmetallic Mineral Mining Convention and Exposition ever, the State Chairmen of the National Program Committee with National Chairman Otto Herres presiding, will be gathered in Denver to formulate a program embodying the essence of the several hundred suggested topics sent in by committee members and other interested mining men from every corner of the nation.

These suggestions indicate the trend of the industry's thinking on all phases of mining. With them as a guide, the State Chairmen will evolve an outstanding program, one in which leading authorities will help solve many of the problems posed by mining's effort to increase output in the face of great economic and political odds. Each mining man owes himself, his employer and his country a duty to attend the meeting and to study and absorb all he can from the stimulating addresses and penetrating analyses of current problems.

At the same time he will want to spend every moment possible in the exhibition halls—to see for himself the almost unbelievable array of mining machinery, equipment and supplies that modern science and manufacturing ingenuity have provided. There also, he will be able to discuss with manufacturers' representatives the merits of each new aid to better mining and milling operations.

At present writing, 141 exhibitors are designing the displays that will occupy the entire 43,000 sq ft of exhibit space within the huge City Auditorium, together with several large parking lots outside where mammoth units, too big for the hall, will be shown.

Rewarding as attendance in the meeting rooms and exhibit halls will be, no convention is complete without a full measure of entertainment and relaxation. The traditional Miners' Jamboree will take place in Denver's Rainbow Ballroom—providing an evening replete with food, fun and entertainment without parallel. All the mining men and their ladies will want to take in this party, as well as the other splendid entertainment features that are so much a part of American Mining Congress Conventions.

No less enjoyable and at the same time affording an insight into "how the other fellow is doing it" are the field trips and visits which are being scheduled to round out the convention week. Here is an opportunity to enjoy the scenic beauty and historic background of the mining empire that surrounds this Capital of Western Mining.

Those who have not done so already (and requests have been coming in since last year) had better make hotel reservations immediately to avoid disappointment or inconvenience later on. Write, wire or telephone the Denver Convention and Visitors Bureau, 225 West Colfax Ave., Denver, Colo.

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## General Mines Plans Development

General Mines Corp. has announced that recent rounds in the west drift on the 200-ft level of the firm's property on the Little Pine Creek, west of Kellog, Idaho, have opened some of the best ore yet found in the mine. Lower workings were unwatered and rehabilitated. About 200 ft of westerly drifting was done in 1951, and $40,000 was spent on improvements and development work at the property. The 3300-ft track line on the main adit level has been rebuilt and raise work above this level is to be resumed within a short time.

## Will Process Asbestos

Construction of a large asbestos processing plant by the Alonzo Mining and Milling Co., is scheduled soon in the Clear Creek area of Hernandez Valley in San Benito County, Calif. Don F. Alonzo, president, states the plant will produce 1500 tons of finished product monthly which will be shipped to the Philippine Islands under a government contract. The company has acquired about four sq. mi. of land in the area, and will employ 300 men during the building of the plant. Preparations are being completed for extensive development and mining of the deposits.

## Yellowhead Ore to be Milled

Pend Oreille Mines and Metals Co., at Metaline Falls, Wash., reports it intends to start milling ore from its Yellowhead claims. The ore has a large iron content which previously made it unamenable to treatment along with Josephine and other ores. Pend Oreille has recently received some new equipment for installation at the mill.

## New Uranium Areas Cited

"Recent finds of uranium deposits in South Dakota and Wyoming," the U. S. Geological Survey has said "point to a whole new area that is favorable for prospecting for uranium." Carnotite, one of the principal ores of uranium, was found last June in the Craven canyon area about eight miles north of Edgemont, S. D., and members of the Survey have been investigating the area since then. The ore is similar, in some respects, to the ores of the Colorado Plateau area.

Craven Canyon is a little over 100 miles southeast of the uranium deposits recently discovered in the Pumpkin Buttes area of northeastern Wyoming, where the Atomic Energy Commission recently announced that the Interior Department was withdrawing a large block of public land from public entry while further geological studies were made.

## Eureka Corp.

The Eureka Corp. of Canada is awaiting a Federal loan before starting rehabilitation of its Richmond-Eureka lead-zinc-silver property at Ruby Hill, four miles from Eureka, Nev. Repairs and development work have been conducted at the four-compartment Fad shaft for several months and 30 men are employed.

Rehabilitation of deep workings and development of ore bodies below the Ruby Hill fault presents a costly and complex problem, requiring a large capital investment. Water flooded the lower levels of the 2350-foot Fad shaft early in 1949 and it is expected the water problem will be difficult and costly to master.

## Colorado Coal Mine Shut

The Wadge and Pinnacle coal mines have been closed and their equipment is being liquidated. Owned by the Victor-American Fuel Co., the mines are located in Mt. Harris, Colo., and Oak Creek, Colo. The Wadge mine had a production of 55,782 tons in 1949.

## Standard Mine Changes Hands

Ray Summers, John Day, Ore., has purchased the lease on the old Standard Mine north of Prairie City, Ore., from Bert Hayes. The Standard Mine is reputedly one of the oldest lode mines in the United States. Development of the property started about 1880 but the most active period was between 1900 and 1907.

The mine is noteworthy in that the ore contains cobalt. Principal production has been copper, but vein minerals are unusually varied.

## Open Mexican Iron Deposits

Two important iron deposits, located in the state of Colima, Mexico, are soon to be exploited on a large scale basis, according to Governor J. Jesús Gonzalez Lugo, in a report forwarded to the President's office in Mexico City. Ore from one of the mines is to be earmarked for export to Japan and the United States, he said.

The iron deposits of "El Mamey" in the Minatitlán zone, some 70 kilometers from Manzanillo, can produce from 80,000,000 to 100,000,000 tons of ore. This production, according to an agreement reached with Government authorities, will be shipped solely to the Iron & Steel Foundry of Monterrey.

The other deposits, located in Piscila, have reserves estimated at from 6,000,000 to 8,000,000 tons. Ore from here will be exported, chiefly to Japan and the United States, according to the governor who revealed that the Alvarez del Castillo mining firm has the concession on this mine.

The Castillo company has opened a road to Manzanillo to facilitate shipment of ore abroad. Financing for both operations is to be provided by private interests.

## Exploration Program Grows

Fifteen new defense mineral exploration contracts totaling more than $1,400,000 in Federal and private funds have been signed with mining property owners and operators, it was announced April 20 by J. H. East, Jr., U. S. Bureau of Mines regional director at Denver, Colo. The properties are located in Colorado, Utah, Arizona and New Mexico. These latest contacts bring the total Federal-private funds being spent in this region for exploration to more than $5,000,000, with the government bearing about 55 percent of the load.

## To Aid Tungsten Supply

The tungsten unit at the Hillside Mining and Milling Co.'s mill, Hillside, Ariz., is nearing completion. The unit is an addition to the present lead-zinc-concentrator and will be used to treat both company and custom ores, and is a conventional gravity plant of 300 tons capacity. The gravity section includes crushing and grinding equipment with concentration by flotation, tabling and magnetic separation.

Principal production for the mill will come from the Tungstona and Black Pearl mines.

The Tungstona is operated by Hillside Mining and Milling Co. under a lease agreement and has been under development for the last year.

The Black Pearl is located in the Eureka Mining District and is being developed by Edgar A. Scholz and J. H. Cazier under leasing arrangements. It has been an intermittent producer since its discovery in 1914.

Sixteen miles of road are being built to connect the Black Pearl with the Hillside mill, under the government's access road program.

## Lease Wasa Property

The Western Montana Exploration and Development Co. of Missoula, Mont., has arranged a lease and option with the Jensen Brothers of Seattle and the Ryan interests of Spokane to develop and mine zinc, lead and copper ore from claims covering the old Wasa ground, it was announced recently by Dr. Roy W. Key, president and general manager of the company. The Wasa ground lies about 10 miles southeast of Hall in Granite County, Mont. The U. S. Bureau of Mines has estimated that from 127,000 to 150,000 tons of mineable ore remain in the area where 88,000 tons of ore were mined during World War II.

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## Rehabilitate Weber Mine

Development work is to be resumed by New Rainbow Mining Co. at the Weber mine near Lakeview, Idaho. The property was leased last summer from Robert B. Austin, who has made regular shipments of silver ore from surface open pit operations for several years.

The company has installed machinery, done rehabilitation work and started opening the main adit. About 700 ft of the 1700-ft crosscut tunnel remains to be cleaned out. Work at the property was stopped last fall because of heavy snowfalls. Virtually all necessary equipment is on hand for the development work. The underground workings are in silver, lead and zinc ore.

## Comstock Produces Again

Gold production was resumed recently on the Comstock Lode when Big Three Mining Corp. started operation of the Spring Valley property at Silver City, Nev. Ore is treated at the Silver Hill mill and the company plans to handle 100 tons daily when open pit mining attains full operation.

Located on the Silver City gold-bearing branch of the Comstock Lode, the Spring Valley was worked as an underground mine by various operators for brief periods and produced some high-grade gold-silver ore. Open pit mining has been in progress several weeks, with milling ore exposed, according to the management. The property was reopened last fall after a long period of inactivity. It is now the lone producer on the Comstock Lode.

## Mining Oregon Black Sand

Coast Minerals Co., Ltd., is reported to have started stripping operations on its black sand deposit in Coos County, Ore. Black sand deposits on Whisky Run Beach are also said to have been developed for future production. Probably Whisky Run was the scene of the first discovery of rich placer gold along the Oregon beaches.

## Mineral King to Reopen

The Mineral King Mining Co., in the Coeur d'Alene district, will shortly resume operations at its lead-zinc-silver property in Mineral County, Mont.

## Work on Sulphur Plant

Chemical Corp. of America plans to have its elemental sulphur plant near Sulphurdale in Beaver County, Utah operating in the near future. Clarence R. King, consulting engineer, has said that should the 100-ton pilot plant prove reduction of the low grade sulphur ore to be commercially feasible, the firm contemplates erection of a 1000-ton mill.

Diamond drilling operations during the past year have proved large reserves of 25 percent sulphur bearing conglomerate. Additional diamond drilling is planned this year. The deposit will be mined by open pit operations and milled by conventional methods.

## Explore Gold Ledges

Development of two gold ledges is progressing in properties of the Willow Valley Mines two miles east of Nevada City, Calif. The management is driving a crosscut westward from the Bellfountaine shaft to locate downward continuations of the Le Compton and Norton veins. A ledge of sulphide gold ore about seven ft wide was discovered in the St. Louis mine last October in the 435-ft Omega extension drift from the 2565-ft Jackson tunnel. Four months ago another vein was found in the Omega extension claim, 3000 ft from the St. Louis tunnel portal.

The Le Compton produced ore averaging $40 a ton in the 1860's and for a number of years ranked high among gold producers in the region.

## Expand Beryllium Mine

Earl Cannon and his son at Chewelah, Wash., are mining beryllium ore from his property 10 miles north of Chewelah. Cannon holds lease on adjacent ground for further development. A road to the mine is to be bulldozed shortly to bring in the supplies and equipment that will be purchased this summer.

## Open New Discovery

Hypotheek Mining Co., Wallace, Idaho, is developing a mineral showing, found on ground on the strike of of the Hypotheek vein system recently purchased from the King of Pine Creek Co. Hypotheek first opened an old surface tunnel and found a narrow vein of lead-zinc ore rich enough to warrant stockpiling. Then a diamond drill hole into the footwall disclosed another vein some 30 ft wide. The company is now driving a crosscut to this vein. In the meantime the old mine has been dewatered to the 1000-ft level and preparations are underway to open the new discovery from that horizon.

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## Black Rock Sulphur Plant

Black Rock Desert Mineral Co. has completed arrangements for installation of more milling facilities and a refining plant at its Black Rock Sulphur property in the Devil's Corral area at Sulphur, on the edge of the Rabbitt Hole placer gold district of Nevada. Harold J. Adams, president, reports the company plans to increase production to 400 tons of agricultural sulphur and 125 tons of pure chemical mineral daily.

Refined sulphur will be sold to the sulphuric acid industry. The company started operations last fall and is shipping agricultural sulphur to European and North American markets. Mining of the huge deposit is conducted in an open pit with a power shovel, approximately 80 tons of material reported running 20 to 35 percent sulphur are milled daily. Black Rock Desert Mineral Co. controls 1100 acres of patented land in the Devil's Corral area, estimated to contain more than 5,000,000 tons of commercial grade sulphur. One end of the huge deposit towers 150 ft and is reported to persist to a depth varying from 75 to 100 ft. The property, first worked some 60 yrs ago, is 60 miles northwest of Lovelock, Nev.

## Greater Butte Project Grows

In a speech at the dedication of the new Civic Center in Butte, Mont., Edward S. McGlone, vice-president in charge of western operations, Anaconda Copper Mining Co., told of the possibility of another vast new mining project in Butte. He made a prediction that zinc production there could be more than doubled in the next five years and announced that the Kelley Mine is now in production and that a $4,000,000 expansion program is under way at the Anaconda reduction works.

In his report, McGlone stated that the Kelley Mine is now producing ore at the rate of 2000 tons a day and that this would be stepped up to 5000 tons by May and 9000 tons within the year. Original reserve estimates of the amount of ore for the Greater Butte Project were conservative. Several million tons already have been added to these and "in one area it is not unlikely that future exploration work will add another 100,000,000 tons to the original figure of 150,000,000." This could result in another new project which could be mined concurrently with the Greater Butte Project.

Confidence in the increased zinc production is indicated by the $4,000,000 modernization and expansion of copper, zinc and manganese concentrating facilities at Anaconda, Mont. When this is completed, the reduction works will have a capacity to treat in excess of 32,000 tons of ore a day.




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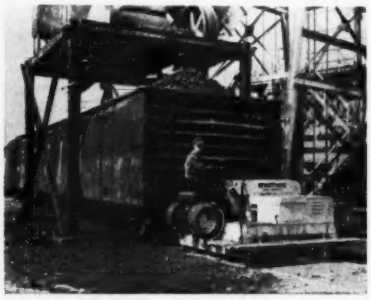
# Manufacturers Forum

## Speed Car Loading

Use of two Whiting Trackmobiles is helping Peabody Coal Co. to achieve important time and manpower savings both in its method of handling coal car loading and in the job of moving loaded cars at its new Mine 10 near Pawnee, Ill.

In addition to speeding up the coal



loading cycle, the Trackmobiles provide increased efficiency in many other car moving, spotting and switching jobs incidental to mine construction and operation. The Trackmobiles, made by Whiting Corporation, Harvey, Ill., were placed in service during the early construction period of the mine. They have been in daily use ever since, handling as much as 1700 tons per day on a double shift basis.

Full advantage is taken of Trackmobile flexibility in road or track operation and its freedom from ever being "bottled up." Use of the Trackmobile, for example, eliminated the expense of grading at the temporary tipple to create a "hump" or the need for mechanical car pullers.

The primary job of the Trackmobile is to expedite coal car loading and the job of moving loaded cars out from the yard during the development period of the mine. Time-saving service is also achieved in moving incoming cars of materials and equipment and in spotting cars for construction work.

Although the Trackmobile weighs only 6000 lb, it pulls many times its own weight and may be compared in power to the conventional 20-ton plant locomotive according to the manufacturers. The Trackmobile derives this power from hydraulic jacking after coupling to the railway car. The mated couplers are raised sufficiently to enable the Trackmobile to borrow tractive weight from the car it pushes or pulls. Maximum draw-bar pull of the Trackmobile is rated at 7350 lb.

## Joy Manufacturing Expands

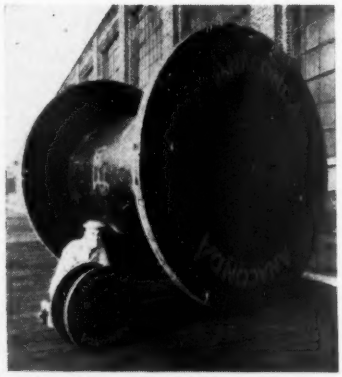
Control of the Craig Bit Co., Ltd., of North Bay, Ont., has been acquired by the Joy Manufacturing Co., according to a recent announcement.

The Craig Bit Co. was started by mining interests in Canada to manufacture and sell a patented rock bit, which Joy is licensed to manufacture and sell in the U. S.

## Buy Iron Company

The National Malleable and Steel Castings Co. of Cleveland has signed a contract to purchase for cash all of the capital stock of Capitol Foundry Co. of Phoenix, Ariz. Capitol's subsidiary, Arizona Iron Works, is included in the purchase.

A $1,500,000 program to expand and improve the Phoenix properties will be undertaken immediately, according to Cleve H. Pomeroy, president of National Malleable.



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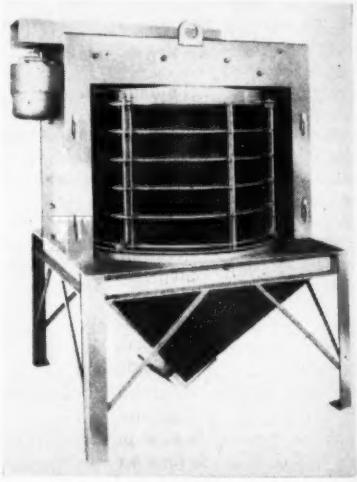
## Improve Screening Performance

The "SYMONS" V Screen, a new high capacity unit for sharp separation of wet or dry materials from four mesh to the very fine meshes is announced by Nordberg Manufacturing Co. following thorough testing in the field.

Combining a centrifugal action the equivalent of five times the force of gravity with a gyratory movement, the new screen has the ability, depending upon the type of material being screened, to considerably in-



crease existing capacities and also provide utilization of product heretofore difficult to screen according to its makers. Since the screen is used in circuit with other equipment however, its capacity depends on factors other than the screen itself.

With a minimum of height and width, the screen requires little floor space and it is easily installed. Its vertical design makes it particularly advantageous for use under vertical chutes. The unit is completely enclosed assuring dustless operation and easily removable covers permit ready access to the screen. The actuating mechanism is mounted on roller bearings and the vertical frame is constructed of standard steel shapes and plates.

This cylindrical screen, mounted

vertically, is presently manufactured in one size, three ft high and 12 ft in circumference, resulting in 36 sq ft of screening surface. It is built with various types of discharge bases either wet or dry depending upon installation requirements.

In dry screening the natural fanning action carries the "air float" fines through with the undersize. This fanning action makes the "SYMONS" V Screen very effective in screening light weight materials. It has been used successfully in the field for screening pumice, sand, plaster sand, coal dust, copper ore, potash, volcanic cinders, crushed mica, ground phosphate rock and crushed rock.

## Better Shooting Possible

A new multiple-shot blasting unit, said to incorporate improved firing action, safety and dependability in a compact and lightweight assembly, is being introduced by Mine Safety Appliances Co., Pittsburgh, Pa.

The new MSA Multiple-Shot Blast-

ing (U. S. Bureau of Mines Approval No. 1608) weighs one lb, measures 2½ by 2¼ by 4¾ in., and is carried on the belt by means of a snap-on clip. It will fire up to 10 shots simultaneously. There is no danger of accidental firing, designers point out, as the wiring circuit is completely insulated from the battery container. Because the new unit is capacitor-operated, the full charge is dissipated with each shot, eliminating misfires.

The firing plug is equipped with brass contact terminals. Lead wires are firmly held in the firing plug by spring-loaded retainers. When lead wires are inserted, and the firing plug pressed firmly into the battery container, a neon light glows at the top of the case to indicate a full charge in the capacitor. Release sends high voltage to detonate the charge.

Detailed information is contained in a new bulletin, No. 0901-1, available without charge or obligation from Mine Safety Appliances Co., Braddock, Thomas & Meade Streets, Pittsburgh 8, Pa.

## Re-enter Shovel Field

American Hoist & Derrick Co., St. Paul, Minn., announces its re-entry into the shovel field with a completely new ¾-cu yd Crawler Crane—available as a crane, shovel, dragline or pull shovel. The new Model 375 BC follows the same basic design as the 80-ton capacity locomotive crane and 100-ton revolving crane. The machinery platform is an integral rolled steel electrically welded unit, rather than the conventional cast center with bolted-on walkways. Track pads are double walled, special steel castings with full length pins. Special steel is used to reduce abrasive wear to a minimum and withstand the shock and strain of rough travel.

A high speed boom hoist with controlled lowering arrangement is standard equipment. Boom radius may be changed with perfect control and without danger of dropping the boom. Actually the boom lowers against the compression of the engine and can be lowered at any speed desired by the operator.

## Offer One-Piece Bit

Following the acceptance of the chisel-type Intra-Set drill steel, in which steel and carbide bit are integral, the Rock Bit Sales & Service Co. now offers four-point Intra-Set steel. This is made in 1⅛ to 2¼-in. gauge sizes and in lengths up to 12 ft, with shanks to fit any hammer. As the alloy drill steel and carbide bit are of one piece construction, there are no attachments to loosen, bind or strip. The manufacturers' claims, that in field operations, the four-point Intra-Set steel drills faster and further, gauge loss is less, sharpening required less frequently, longer life results and that a neat round hole is drilled for follow-up work. Descriptive bulletin available from Rock Bit Sales & Service Co., 2514 East Cumberland St., Philadelphia 25, Pa.

## —*Announcements*—

**W. L. Wearly** has been advanced to general sales vice-president in charge of all domestic sales for **Joy Manufacturing Co.**; **Hugo C. Nyquist** succeeded Wearly as vice-president in charge of coal machinery sales and **J. Stewart Morrow** was named to the new post of sales manager of oxygen equipment.

**G. A. Thoma** has succeeded **John F. Corkery** as sales promotion manager for **Independent Pneumatic Tool Co.** Corkery was made manager of electric tool sales.

**W. L. Litle** was recently elected president and chief executive officer in all operating matters of the **Bucyrus-Erie Co.** Litle has been with the company, or its successors, for 26 years.

**Alfred W. Crew** has joined the **Republic Rubber Division**, Lee Rubber & Tire Corp., Youngstown, Ohio, as a field engineer with headquarters in Charleston W. Va. Prior to assuming his new position, Crew was associated with the Joy Manufacturing Co.

The addition of **Wilfred G. Carrie**, as a project engineer, to the staff of the Dust & Fume Control Division, **American Wheelabrator & Equipment Corp.**, Mishawaka, Ind., has been announced by L. L. Andrus, vice president. Carrie is a veteran of 25 years' experience with Consolidated Mining & Smelting Co., Trail, B. C., most recently as a smoke treatment engineer.

## CATALOGS AND BULLETINS

CONVEYOR BELT. *Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.* Ray-Man "F" Conveyor Belt, recently developed with an engineered strength member which is claimed to offer several important advantages over conventional duck belts, is described in this bulletin. Copies may be obtained by requesting Bulletin No. 6915 from the above address.

RUNNING-TIME RECORDERS. *The Bristol Co., Waterbury 20, Conn.* This bulletin gives information concerning the application of the Running-Time Recorder to presses, factory machinery, pumps and motors, conveyors, continuous ovens, and furnaces. It is illustrated with photos of various models, reproductions of chart records, and operation drawings. Photographs of several installations of the newly-announced instrument are also included. In addition, brief descriptions of other Bristol Production Recorders are given. Bulletin OP1504 is available from the company on request

TISCO WELDING PRODUCTS. *Taylor-Wharton Iron & Steel Co., High Bridge, N. J.* A six-page folder dealing with Tisco Timang Manganese-Nickel Steel Welding Products and Cast Manganese Steel Point Bars—Grouser Bars and Repointers. Describes methods of applying Timang. The folder is available upon request.

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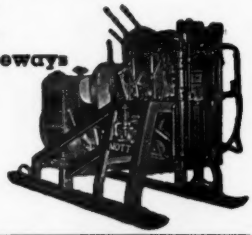

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